Untitled

2024-05-06

```r
library("MASS")
library(e1071)
library(ggplot2)

data(Boston)
```

SVR With Linear Kernel

```r
set.seed(42)

test = sample(1:nrow(Boston), size=100)
train = which(!(1:nrow(Boston)) %in% test)

cost <- c(0.001, 0.01, 0.1, 1, 10)
epsilon <- c(0.001, 0.01, 0.1, 1)

tune.out <- tune(svm, medv ~., data = Boston[train, ], kernel = "polynomial", ranges=list(cost=cost))

plot(tune.out)
```


Performance of 'svm'
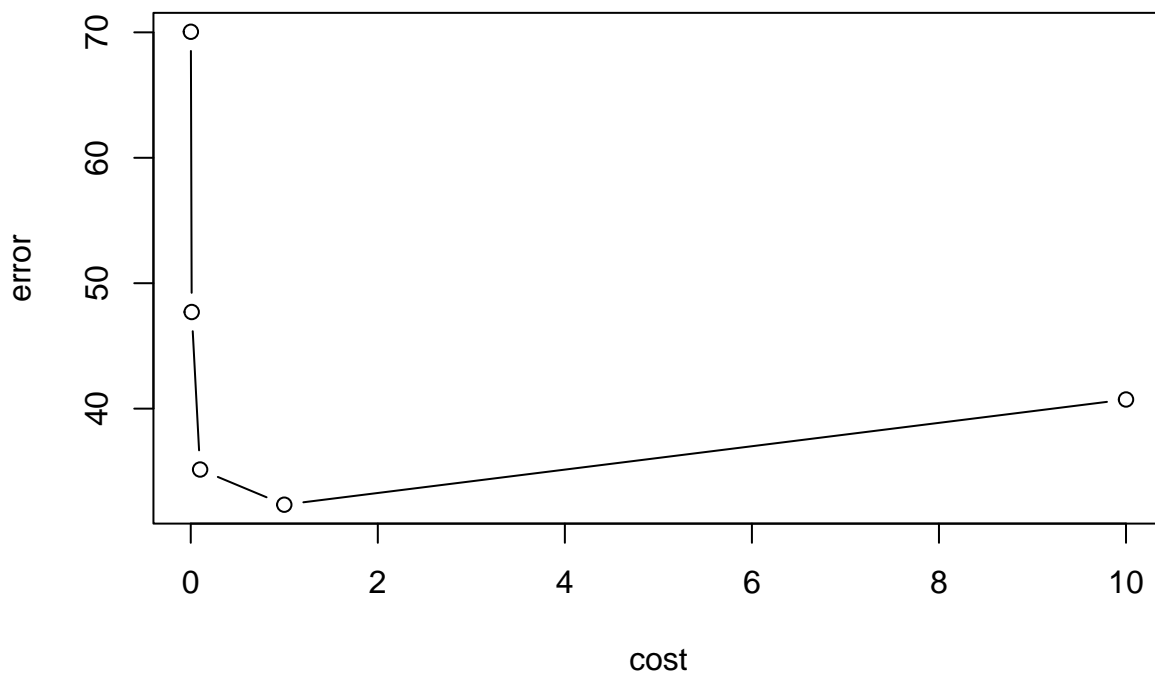
```
print(tune.out$best.parameters)

##   cost
## 4    1

data(Boston)
set.seed(42)

test = sample(1:nrow(Boston), size=100)
train = which(!(1:nrow(Boston)) %in% test)

cost <- c(0.001, 0.01, 0.1, 1, 10)
epsilon <- c(0.001, 0.01, 0.1, 1)

tune.out <- tune(svm, medv ~., data = Boston[train, ], kernel = "linear", ranges=list(cost=cost, epsilon

perf <- tune.out$performances
perf$cost <- factor(perf$cost)
error <- tune.out$performances$error
#print(tune.out$performances)
optimal_vals <- tune.out$best.parameters
print(optimal_vals)

##     cost epsilon
## 13  0.1     0.1

ggplot(perf) + geom_line(aes(epsilon, error, group=cost, color=cost)) + scale_x_log10() + scale_y_log10
```
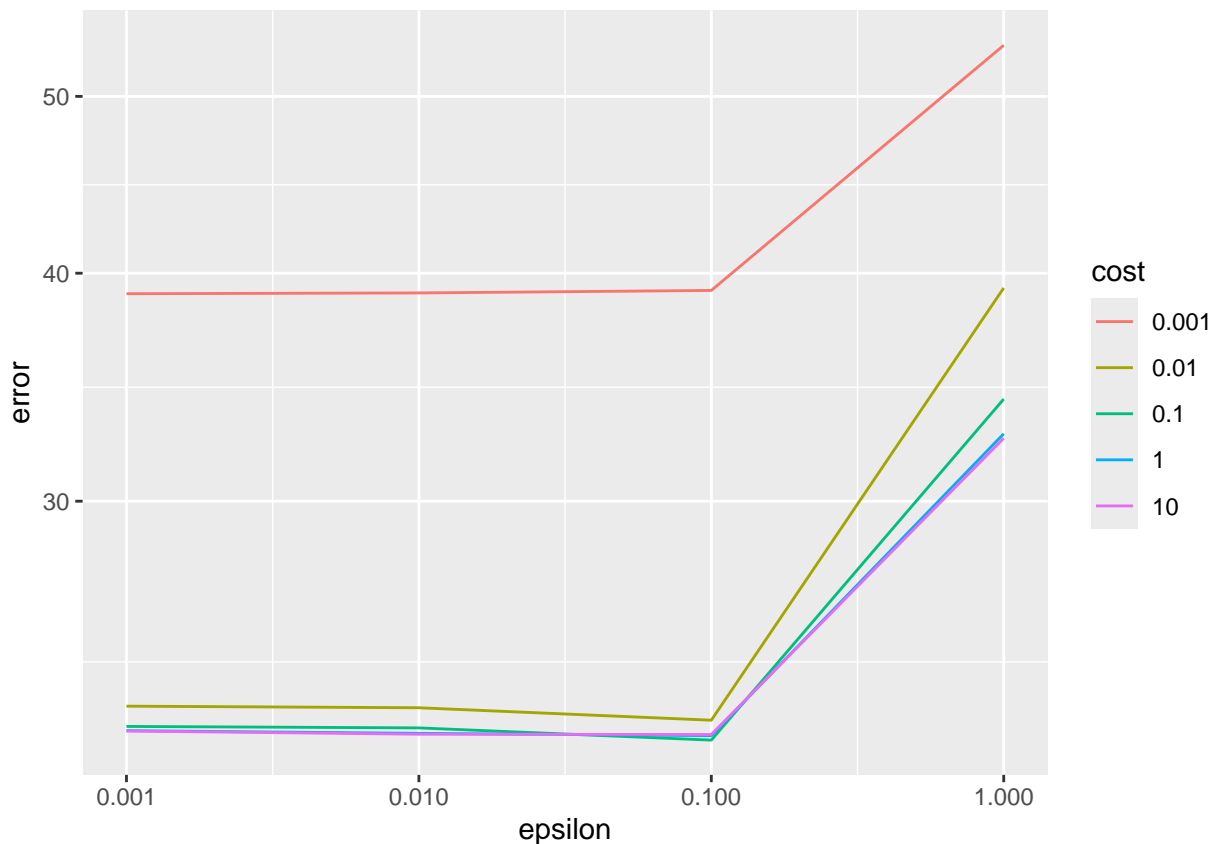

The graph in this case has a convex shape. We find that the best parameters for our study is an epsilon of

0.1 and a cost of 0.1. This is also reflected in our graph where it dips at close to 0.25/2. However, it is also better to experiment with more fine-grained values once you have an initial estimate.

```
cost <- c(0.015, 0.01, 0.1, 0.15, 0.2)
epsilon <- c(0.015, 0.01, 0.1, 0.15)

tune.out <- tune(svm, medv ~., data = Boston[train, ], kernel = "linear", ranges=list(cost=cost, epsilon

perf <- tune.out$performances
perf$cost <- factor(perf$cost)
error <- tune.out$performances$error
#print(tune.out$performances)
optimal_vals <- tune.out$best.parameters
print(optimal_vals)
```

```
##    cost epsilon
## 18  0.1    0.15
```

```
ggplot(perf) + geom_line(aes(epsilon, error, group=cost, color=cost)) + scale_x_log10()
```
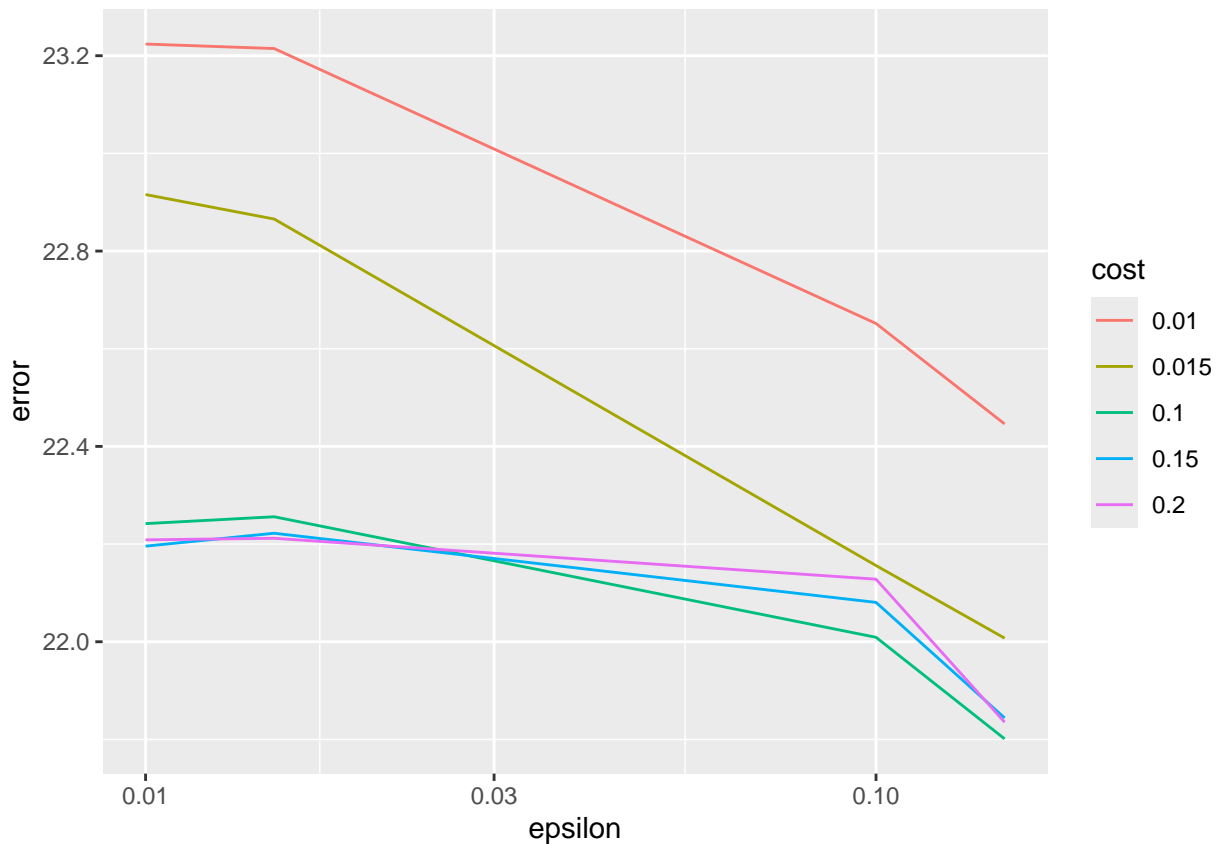

The graphs in this case do not have a nice convex shape as we hoped. However, through more fine-tuning we find that the ideal parameters for cost and epsilon are 0.2 and 0.15 respectively.

```
svmfit <- svm(medv ~., data = Boston[train,], kernel ="linear",
            epsilon= tune.out$best.parameters$epsilon,
            cost =tune.out$best.parameters$cost)

tab <- table(true = Boston[test, "medv"], pred=predict(svmfit, newdata=Boston[test,]))
print(tab)
```

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```
##        pred
## true    4.46832968964286 5.43672184475695 5.94202743472564 6.00161566669524
##    5                   0                0                0                1
##    7                   0                0                0                0
##    7.2                 0                0                0                0
##    8.4                 0                0                0                0
##    8.5                 0                0                0                0
##    10.4                0                0                1                0
##    10.5                1                0                0                0
##    11.5                0                0                0                0
##    11.8                0                0                0                0
##    11.9                0                0                0                0
##    12                  0                0                0                0
##    13.1                0                0                0                0
##    13.2                0                0                0                0
##    13.5                0                0                0                0
##    13.6                0                0                0                0
##    13.8                0                1                0                0
##    14.3                0                0                0                0
##    14.4                0                0                0                0
##    14.5                0                0                0                0
##    14.6                0                0                0                0
##    15.2                0                0                0                0
##    15.3                0                0                0                0
##    16.1                0                0                0                0
##    16.2                0                0                0                0
##    16.8                0                0                0                0
##    17.1                0                0                0                0
##    17.5                0                0                0                0
##    17.6                0                0                0                0
##    17.8                0                0                0                0
##    18.1                0                0                0                0
##    18.2                0                0                0                0
##    18.5                0                0                0                0
##    18.6                0                0                0                0
##    18.7                0                0                0                0
##    19.2                0                0                0                0
##    19.3                0                0                0                0
##    19.4                0                0                0                1
##    19.6                0                0                0                0
##    19.8                0                0                0                0
##    19.9                0                0                0                0
##    20                  0                0                0                0
##    20.3                0                0                0                0
##    20.5                0                0                0                0
##    20.6                0                0                0                0
##    21.4                0                0                0                0
##    21.6                0                0                0                0
##    21.7                0                0                0                0
##    21.9                0                0                0                0
##    22.5                0                0                0                0
##    22.6                0                0                0                0
##    22.7                0                0                0                0
##    23                  0                0                0                0
```

```
## 23.1              0           0           0           0
## 23.4              0           0           0           0
## 23.6              0           0           0           0
## 23.7              0           0           0           0
## 23.8              0           0           0           0
## 23.9              0           0           0           0
## 24.5              0           0           0           0
## 24.7              0           0           0           0
## 25                0           0           0           0
## 26.4              0           0           0           0
## 26.7              0           0           0           0
## 27.1              0           0           0           0
## 27.5              0           0           0           0
## 27.9              0           0           0           0
## 28.6              0           0           0           0
## 29.6              0           0           0           0
## 29.8              0           0           0           0
## 30.8              0           0           0           0
## 31.6              0           0           0           0
## 33.2              0           0           0           0
## 33.3              0           0           0           0
## 33.4              0           0           0           0
## 34.7              0           0           0           0
## 36                0           0           0           0
## 36.2              0           0           0           0
## 36.5              0           0           0           0
## 37.3              0           0           0           0
## 41.3              0           0           0           0
## 43.1              0           0           0           0
## 46                0           0           0           0
## 50                0           0           0           0
##       pred
## true   6.45024198662215 6.84781168415082 9.46276859786192 10.3954533238182
## 5                 1           0           0           0
## 7                 0           0           0           0
## 7.2               0           0           0           0
## 8.4               0           0           0           0
## 8.5               0           1           0           0
## 10.4              0           0           0           0
## 10.5              0           0           0           0
## 11.5              0           0           0           0
## 11.8              0           0           0           0
## 11.9              0           0           0           0
## 12                0           0           1           0
## 13.1              0           0           0           0
## 13.2              0           0           0           0
## 13.5              0           0           0           0
## 13.6              0           0           0           0
## 13.8              0           0           0           0
## 14.3              0           0           0           0
## 14.4              0           0           0           1
## 14.5              0           0           0           0
## 14.6              0           0           0           0
## 15.2              0           0           0           0
```

```
##   15.3               0               0               0               0
##   16.1               0               0               0               0
##   16.2               0               0               0               0
##   16.8               0               0               0               0
##   17.1               0               0               0               0
##   17.5               0               0               0               0
##   17.6               0               0               0               0
##   17.8               0               0               0               0
##   18.1               0               0               0               0
##   18.2               0               0               0               0
##   18.5               0               0               0               0
##   18.6               0               0               0               0
##   18.7               0               0               0               0
##   19.2               0               0               0               0
##   19.3               0               0               0               0
##   19.4               0               0               0               0
##   19.6               0               0               0               0
##   19.8               0               0               0               0
##   19.9               0               0               0               0
##   20                 0               0               0               0
##   20.3               0               0               0               0
##   20.5               0               0               0               0
##   20.6               0               0               0               0
##   21.4               0               0               0               0
##   21.6               0               0               0               0
##   21.7               0               0               0               0
##   21.9               0               0               0               0
##   22.5               0               0               0               0
##   22.6               0               0               0               0
##   22.7               0               0               0               0
##   23                 0               0               0               0
##   23.1               0               0               0               0
##   23.4               0               0               0               0
##   23.6               0               0               0               0
##   23.7               0               0               0               0
##   23.8               0               0               0               0
##   23.9               0               0               0               0
##   24.5               0               0               0               0
##   24.7               0               0               0               0
##   25                 0               0               0               0
##   26.4               0               0               0               0
##   26.7               0               0               0               0
##   27.1               0               0               0               0
##   27.5               0               0               0               0
##   27.9               0               0               0               0
##   28.6               0               0               0               0
##   29.6               0               0               0               0
##   29.8               0               0               0               0
##   30.8               0               0               0               0
##   31.6               0               0               0               0
##   33.2               0               0               0               0
##   33.3               0               0               0               0
##   33.4               0               0               0               0
##   34.7               0               0               0               0
```

```
##   36                 0              0                0                0
##   36.2               0              0                0                0
##   36.5               0              0                0                0
##   37.3               0              0                0                0
##   41.3               0              0                0                0
##   43.1               0              0                0                0
##   46                 0              0                0                0
##   50                 0              0                0                0
##       pred
## true   10.5270788088278 11.5731961956604 11.775787576104 12.0605308265842
##   5                  0              0                0                0
##   7                  1              0                0                0
##   7.2                0              0                0                0
##   8.4                0              0                0                0
##   8.5                0              0                0                0
##   10.4               0              0                0                0
##   10.5               0              0                0                0
##   11.5               0              0                0                1
##   11.8               0              0                0                0
##   11.9               0              0                0                0
##   12                 0              0                0                0
##   13.1               0              0                0                0
##   13.2               0              1                0                0
##   13.5               0              0                0                0
##   13.6               0              0                0                0
##   13.8               0              0                0                0
##   14.3               0              0                0                0
##   14.4               0              0                0                0
##   14.5               0              0                0                0
##   14.6               0              0                0                0
##   15.2               0              0                0                0
##   15.3               0              0                0                0
##   16.1               0              0                0                0
##   16.2               0              0                0                0
##   16.8               0              0                0                0
##   17.1               0              0                0                0
##   17.5               0              0                0                0
##   17.6               0              0                0                0
##   17.8               0              0                1                0
##   18.1               0              0                0                0
##   18.2               0              0                0                0
##   18.5               0              0                0                0
##   18.6               0              0                0                0
##   18.7               0              0                0                0
##   19.2               0              0                0                0
##   19.3               0              0                0                0
##   19.4               0              0                0                0
##   19.6               0              0                0                0
##   19.8               0              0                0                0
##   19.9               0              0                0                0
##   20                 0              0                0                0
##   20.3               0              0                0                0
##   20.5               0              0                0                0
##   20.6               0              0                0                0
```

```
##    21.4              0              0              0              0
##    21.6              0              0              0              0
##    21.7              0              0              0              0
##    21.9              0              0              0              0
##    22.5              0              0              0              0
##    22.6              0              0              0              0
##    22.7              0              0              0              0
##    23                0              0              0              0
##    23.1              0              0              0              0
##    23.4              0              0              0              0
##    23.6              0              0              0              0
##    23.7              0              0              0              0
##    23.8              0              0              0              0
##    23.9              0              0              0              0
##    24.5              0              0              0              0
##    24.7              0              0              0              0
##    25                0              0              0              0
##    26.4              0              0              0              0
##    26.7              0              0              0              0
##    27.1              0              0              0              0
##    27.5              0              0              0              0
##    27.9              0              0              0              0
##    28.6              0              0              0              0
##    29.6              0              0              0              0
##    29.8              0              0              0              0
##    30.8              0              0              0              0
##    31.6              0              0              0              0
##    33.2              0              0              0              0
##    33.3              0              0              0              0
##    33.4              0              0              0              0
##    34.7              0              0              0              0
##    36                0              0              0              0
##    36.2              0              0              0              0
##    36.5              0              0              0              0
##    37.3              0              0              0              0
##    41.3              0              0              0              0
##    43.1              0              0              0              0
##    46                0              0              0              0
##    50                0              0              0              0
##         pred
## true   12.2139971294702 12.2983638064436 13.1165304676943 13.8261247230577
##    5                 0                0                0                0
##    7                 0                0                0                0
##    7.2               0                0                0                0
##    8.4               0                0                0                0
##    8.5               0                0                0                0
##    10.4              0                0                0                0
##    10.5              0                0                0                0
##    11.5              0                0                0                0
##    11.8              0                1                0                0
##    11.9              0                0                0                0
##    12                0                0                0                0
##    13.1              0                0                0                1
##    13.2              0                0                0                0
```

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```
##   13.5                  0                  0                  0                  0
##   13.6                  0                  0                  0                  0
##   13.8                  0                  0                  1                  0
##   14.3                  0                  0                  0                  0
##   14.4                  0                  0                  0                  0
##   14.5                  0                  0                  0                  0
##   14.6                  0                  0                  0                  0
##   15.2                  0                  0                  0                  0
##   15.3                  0                  0                  0                  0
##   16.1                  0                  0                  0                  0
##   16.2                  0                  0                  0                  0
##   16.8                  0                  0                  0                  0
##   17.1                  0                  0                  0                  0
##   17.5                  0                  0                  0                  0
##   17.6                  0                  0                  0                  0
##   17.8                  0                  0                  0                  0
##   18.1                  0                  0                  0                  0
##   18.2                  0                  0                  0                  0
##   18.5                  0                  0                  0                  0
##   18.6                  0                  0                  0                  0
##   18.7                  0                  0                  0                  0
##   19.2                  0                  0                  0                  0
##   19.3                  0                  0                  0                  0
##   19.4                  0                  0                  0                  0
##   19.6                  0                  0                  0                  0
##   19.8                  0                  0                  0                  0
##   19.9                  0                  0                  0                  0
##   20                    0                  0                  0                  0
##   20.3                  0                  0                  0                  0
##   20.5                  0                  0                  0                  0
##   20.6                  0                  0                  0                  0
##   21.4                  0                  0                  0                  0
##   21.6                  0                  0                  0                  0
##   21.7                  0                  0                  0                  0
##   21.9                  1                  0                  0                  0
##   22.5                  0                  0                  0                  0
##   22.6                  0                  0                  0                  0
##   22.7                  0                  0                  0                  0
##   23                    0                  0                  0                  0
##   23.1                  0                  0                  0                  0
##   23.4                  0                  0                  0                  0
##   23.6                  0                  0                  0                  0
##   23.7                  0                  0                  0                  0
##   23.8                  0                  0                  0                  0
##   23.9                  0                  0                  0                  0
##   24.5                  0                  0                  0                  0
##   24.7                  0                  0                  0                  0
##   25                    0                  0                  0                  0
##   26.4                  0                  0                  0                  0
##   26.7                  0                  0                  0                  0
##   27.1                  0                  0                  0                  0
##   27.5                  0                  0                  0                  0
##   27.9                  0                  0                  0                  0
##   28.6                  0                  0                  0                  0
```

```
##    29.6              0            0            0            0
##    29.8              0            0            0            0
##    30.8              0            0            0            0
##    31.6              0            0            0            0
##    33.2              0            0            0            0
##    33.3              0            0            0            0
##    33.4              0            0            0            0
##    34.7              0            0            0            0
##    36                0            0            0            0
##    36.2              0            0            0            0
##    36.5              0            0            0            0
##    37.3              0            0            0            0
##    41.3              0            0            0            0
##    43.1              0            0            0            0
##    46                0            0            0            0
##    50                0            0            0            0
##         pred
## true   14.118751006282 14.4225837003745 14.5932852288733 14.7035381876376
##    5                0            0            0            0
##    7                0            0            0            0
##    7.2              0            0            0            0
##    8.4              0            0            0            0
##    8.5              0            0            0            0
##    10.4             0            0            0            0
##    10.5             0            0            0            0
##    11.5             0            0            0            0
##    11.8             0            0            0            0
##    11.9             0            0            0            0
##    12               0            0            0            0
##    13.1             0            0            0            0
##    13.2             0            0            0            0
##    13.5             0            0            0            1
##    13.6             0            0            0            0
##    13.8             0            0            0            0
##    14.3             0            0            1            0
##    14.4             0            0            0            0
##    14.5             0            1            0            0
##    14.6             0            0            0            0
##    15.2             0            0            0            0
##    15.3             0            0            0            0
##    16.1             0            0            0            0
##    16.2             0            0            0            0
##    16.8             0            0            0            0
##    17.1             0            0            0            0
##    17.5             0            0            0            0
##    17.6             0            0            0            0
##    17.8             0            0            0            0
##    18.1             0            0            0            0
##    18.2             0            0            0            0
##    18.5             0            0            0            0
##    18.6             0            0            0            0
##    18.7             0            0            0            0
##    19.2             0            0            0            0
##    19.3             0            0            0            0
```

```
##   19.4              0              0              0              0
##   19.6              0              0              0              0
##   19.8              0              0              0              0
##   19.9              0              0              0              0
##   20                0              0              0              0
##   20.3              0              0              0              0
##   20.5              0              0              0              0
##   20.6              0              0              0              0
##   21.4              0              0              0              0
##   21.6              0              0              0              0
##   21.7              0              0              0              0
##   21.9              0              0              0              0
##   22.5              0              0              0              0
##   22.6              0              0              0              0
##   22.7              0              0              0              0
##   23                0              0              0              0
##   23.1              0              0              0              0
##   23.4              0              0              0              0
##   23.6              0              0              0              0
##   23.7              1              0              0              0
##   23.8              0              0              0              0
##   23.9              0              0              0              0
##   24.5              0              0              0              0
##   24.7              0              0              0              0
##   25                0              0              0              0
##   26.4              0              0              0              0
##   26.7              0              0              0              0
##   27.1              0              0              0              0
##   27.5              0              0              0              0
##   27.9              0              0              0              0
##   28.6              0              0              0              0
##   29.6              0              0              0              0
##   29.8              0              0              0              0
##   30.8              0              0              0              0
##   31.6              0              0              0              0
##   33.2              0              0              0              0
##   33.3              0              0              0              0
##   33.4              0              0              0              0
##   34.7              0              0              0              0
##   36                0              0              0              0
##   36.2              0              0              0              0
##   36.5              0              0              0              0
##   37.3              0              0              0              0
##   41.3              0              0              0              0
##   43.1              0              0              0              0
##   46                0              0              0              0
##   50                0              0              0              0
##        pred
## true   14.7842830841039 15.2680770807598 15.4314183255312 15.5323584157605
##   5                  0                0                0                0
##   7                  0                0                0                0
##   7.2                0                0                0                0
##   8.4                0                1                0                0
##   8.5                0                0                0                0
```

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```
##   10.4                 0                0                0                0
##   10.5                 0                0                0                0
##   11.5                 0                0                0                0
##   11.8                 0                0                0                0
##   11.9                 0                0                0                0
##   12                   0                0                0                0
##   13.1                 0                0                0                0
##   13.2                 0                0                0                0
##   13.5                 0                0                0                0
##   13.6                 0                0                0                1
##   13.8                 1                0                0                0
##   14.3                 0                0                0                0
##   14.4                 0                0                0                0
##   14.5                 0                0                0                0
##   14.6                 0                0                0                0
##   15.2                 0                0                0                0
##   15.3                 0                0                0                0
##   16.1                 0                0                0                0
##   16.2                 0                0                1                0
##   16.8                 0                0                0                0
##   17.1                 0                0                0                0
##   17.5                 0                0                0                0
##   17.6                 0                0                0                0
##   17.8                 0                0                0                0
##   18.1                 0                0                0                0
##   18.2                 0                0                0                0
##   18.5                 0                0                0                0
##   18.6                 0                0                0                0
##   18.7                 0                0                0                0
##   19.2                 0                0                0                0
##   19.3                 0                0                0                0
##   19.4                 0                0                0                0
##   19.6                 0                0                0                0
##   19.8                 0                0                0                0
##   19.9                 0                0                0                0
##   20                   0                0                0                0
##   20.3                 0                0                0                0
##   20.5                 0                0                0                0
##   20.6                 0                0                0                0
##   21.4                 0                0                0                0
##   21.6                 0                0                0                0
##   21.7                 0                0                0                0
##   21.9                 0                0                0                0
##   22.5                 0                0                0                0
##   22.6                 0                0                0                0
##   22.7                 0                0                0                0
##   23                   0                0                0                0
##   23.1                 0                0                0                0
##   23.4                 0                0                0                0
##   23.6                 0                0                0                0
##   23.7                 0                0                0                0
##   23.8                 0                0                0                0
##   23.9                 0                0                0                0
##   24.5                 0                0                0                0
```

```
##    24.7                  0               0               0               0
##    25                    0               0               0               0
##    26.4                  0               0               0               0
##    26.7                  0               0               0               0
##    27.1                  0               0               0               0
##    27.5                  0               0               0               0
##    27.9                  0               0               0               0
##    28.6                  0               0               0               0
##    29.6                  0               0               0               0
##    29.8                  0               0               0               0
##    30.8                  0               0               0               0
##    31.6                  0               0               0               0
##    33.2                  0               0               0               0
##    33.3                  0               0               0               0
##    33.4                  0               0               0               0
##    34.7                  0               0               0               0
##    36                    0               0               0               0
##    36.2                  0               0               0               0
##    36.5                  0               0               0               0
##    37.3                  0               0               0               0
##    41.3                  0               0               0               0
##    43.1                  0               0               0               0
##    46                    0               0               0               0
##    50                    0               0               0               0
##        pred
## true   15.617436594587 15.8415489328978 15.9138722401018 15.9785557825333
##    5                     0               0               0               0
##    7                     0               0               0               0
##    7.2                   0               0               0               0
##    8.4                   0               0               0               0
##    8.5                   0               0               0               0
##    10.4                  0               0               0               0
##    10.5                  0               0               0               0
##    11.5                  0               0               0               0
##    11.8                  0               0               0               0
##    11.9                  0               0               0               0
##    12                    0               0               0               0
##    13.1                  0               0               0               0
##    13.2                  0               0               0               0
##    13.5                  0               0               0               0
##    13.6                  0               0               0               0
##    13.8                  0               0               0               0
##    14.3                  0               0               0               1
##    14.4                  0               0               0               0
##    14.5                  0               0               0               0
##    14.6                  0               0               0               0
##    15.2                  0               0               0               0
##    15.3                  0               0               0               0
##    16.1                  0               0               0               0
##    16.2                  0               0               0               0
##    16.8                  0               0               0               0
##    17.1                  0               0               0               0
##    17.5                  0               0               0               0
##    17.6                  1               0               0               0
```

```
## 17.8                0              0              0              0
## 18.1                0              0              0              0
## 18.2                0              0              0              0
## 18.5                0              0              0              0
## 18.6                0              0              0              0
## 18.7                0              0              0              0
## 19.2                0              0              0              0
## 19.3                0              0              1              0
## 19.4                0              0              0              0
## 19.6                0              0              0              0
## 19.8                0              0              0              0
## 19.9                0              0              0              0
## 20                  0              0              0              0
## 20.3                0              0              0              0
## 20.5                0              0              0              0
## 20.6                0              0              0              0
## 21.4                0              0              0              0
## 21.6                0              0              0              0
## 21.7                0              0              0              0
## 21.9                0              0              0              0
## 22.5                0              0              0              0
## 22.6                0              0              0              0
## 22.7                0              0              0              0
## 23                  0              0              0              0
## 23.1                0              0              0              0
## 23.4                0              0              0              0
## 23.6                0              0              0              0
## 23.7                0              0              0              0
## 23.8                0              0              0              0
## 23.9                0              0              0              0
## 24.5                0              0              0              0
## 24.7                0              0              0              0
## 25                  0              0              0              0
## 26.4                0              0              0              0
## 26.7                0              0              0              0
## 27.1                0              0              0              0
## 27.5                0              0              0              0
## 27.9                0              1              0              0
## 28.6                0              0              0              0
## 29.6                0              0              0              0
## 29.8                0              0              0              0
## 30.8                0              0              0              0
## 31.6                0              0              0              0
## 33.2                0              0              0              0
## 33.3                0              0              0              0
## 33.4                0              0              0              0
## 34.7                0              0              0              0
## 36                  0              0              0              0
## 36.2                0              0              0              0
## 36.5                0              0              0              0
## 37.3                0              0              0              0
## 41.3                0              0              0              0
## 43.1                0              0              0              0
## 46                  0              0              0              0
```

```
## 50                       0                0                0                0
##      pred
## true  16.2869029285669 16.4219494102978 16.7363110527933 16.9359161491865
## 5                        0                0                0                0
## 7                        0                0                0                0
## 7.2                      1                0                0                0
## 8.4                      0                0                0                0
## 8.5                      0                0                0                0
## 10.4                     0                0                0                0
## 10.5                     0                0                0                0
## 11.5                     0                0                0                0
## 11.8                     0                0                0                0
## 11.9                     0                0                0                0
## 12                       0                0                0                0
## 13.1                     0                0                0                0
## 13.2                     0                0                0                0
## 13.5                     0                0                0                0
## 13.6                     0                0                0                0
## 13.8                     0                0                0                0
## 14.3                     0                0                0                0
## 14.4                     0                0                0                0
## 14.5                     0                0                0                0
## 14.6                     0                0                1                0
## 15.2                     0                0                0                0
## 15.3                     0                0                0                0
## 16.1                     0                0                0                0
## 16.2                     0                0                0                0
## 16.8                     0                0                0                0
## 17.1                     0                0                0                0
## 17.5                     0                0                0                0
## 17.6                     0                0                0                0
## 17.8                     0                0                0                0
## 18.1                     0                0                0                0
## 18.2                     0                1                0                0
## 18.5                     0                0                0                0
## 18.6                     0                0                0                0
## 18.7                     0                0                0                0
## 19.2                     0                0                0                0
## 19.3                     0                0                0                0
## 19.4                     0                0                0                0
## 19.6                     0                0                0                0
## 19.8                     0                0                0                0
## 19.9                     0                0                0                0
## 20                       0                0                0                1
## 20.3                     0                0                0                0
## 20.5                     0                0                0                0
## 20.6                     0                0                0                0
## 21.4                     0                0                0                0
## 21.6                     0                0                0                0
## 21.7                     0                0                0                0
## 21.9                     0                0                0                0
## 22.5                     0                0                0                0
## 22.6                     0                0                0                0
## 22.7                     0                0                0                0
```

```
##    23                0                0                0                0
##    23.1             0                0                0                0
##    23.4             0                0                0                0
##    23.6             0                0                0                0
##    23.7             0                0                0                0
##    23.8             0                0                0                0
##    23.9             0                0                0                0
##    24.5             0                0                0                0
##    24.7             0                0                0                0
##    25                0                0                0                0
##    26.4             0                0                0                0
##    26.7             0                0                0                0
##    27.1             0                0                0                0
##    27.5             0                0                0                0
##    27.9             0                0                0                0
##    28.6             0                0                0                0
##    29.6             0                0                0                0
##    29.8             0                0                0                0
##    30.8             0                0                0                0
##    31.6             0                0                0                0
##    33.2             0                0                0                0
##    33.3             0                0                0                0
##    33.4             0                0                0                0
##    34.7             0                0                0                0
##    36                0                0                0                0
##    36.2             0                0                0                0
##    36.5             0                0                0                0
##    37.3             0                0                0                0
##    41.3             0                0                0                0
##    43.1             0                0                0                0
##    46                0                0                0                0
##    50                0                0                0                0
##         pred
## true   17.1608421726223 17.7936502894979 17.8463704525267 17.8615166929633
##    5                0                0                0                0
##    7                0                0                0                0
##    7.2              0                0                0                0
##    8.4              0                0                0                0
##    8.5              0                0                0                0
##    10.4             0                0                0                0
##    10.5             0                0                0                0
##    11.5             0                0                0                0
##    11.8             0                0                0                0
##    11.9             0                0                0                0
##    12                0                0                0                0
##    13.1             0                0                0                0
##    13.2             0                0                0                0
##    13.5             0                0                0                0
##    13.6             0                0                0                0
##    13.8             0                0                0                0
##    14.3             0                0                0                0
##    14.4             0                0                0                0
##    14.5             0                0                0                0
##    14.6             0                0                0                0
```

```
##   15.2             0              0              0              0
##   15.3             0              0              0              0
##   16.1             0              0              0              0
##   16.2             0              0              0              0
##   16.8             0              0              0              0
##   17.1             0              0              0              0
##   17.5             0              0              0              0
##   17.6             0              0              0              0
##   17.8             0              1              0              0
##   18.1             0              0              0              0
##   18.2             0              0              0              0
##   18.5             0              0              0              0
##   18.6             0              0              0              0
##   18.7             0              0              0              0
##   19.2             0              0              0              0
##   19.3             0              0              0              0
##   19.4             0              0              0              0
##   19.6             0              0              0              0
##   19.8             0              0              0              0
##   19.9             0              0              0              0
##   20               0              0              0              0
##   20.3             0              0              0              0
##   20.5             0              0              0              0
##   20.6             0              0              0              0
##   21.4             0              0              0              0
##   21.6             0              0              0              0
##   21.7             0              0              0              0
##   21.9             0              0              0              0
##   22.5             0              0              0              0
##   22.6             0              0              1              0
##   22.7             0              0              0              0
##   23               0              0              0              0
##   23.1             0              0              0              0
##   23.4             0              0              0              0
##   23.6             0              0              0              0
##   23.7             0              0              0              0
##   23.8             0              0              0              0
##   23.9             0              0              0              0
##   24.5             0              0              0              0
##   24.7             0              0              0              0
##   25               0              0              0              0
##   26.4             0              0              0              0
##   26.7             0              0              0              0
##   27.1             0              0              0              0
##   27.5             0              0              0              1
##   27.9             0              0              0              0
##   28.6             0              0              0              0
##   29.6             0              0              0              0
##   29.8             0              0              0              0
##   30.8             0              0              0              0
##   31.6             0              0              0              0
##   33.2             0              0              0              0
##   33.3             0              0              0              0
##   33.4             0              0              0              0
```

```
##    34.7                  0                 0                0                0
##    36                    0                 0                0                0
##    36.2                  0                 0                0                0
##    36.5                  0                 0                0                0
##    37.3                  0                 0                0                0
##    41.3                  0                 0                0                0
##    43.1                  0                 0                0                0
##    46                    0                 0                0                0
##    50                    1                 0                0                0
##       pred
## true   17.9030244017075 17.9059928687112 18.1232213580507 18.1711951802773
##    5                     0                 0                0                0
##    7                     0                 0                0                0
##    7.2                   0                 0                0                0
##    8.4                   0                 0                0                0
##    8.5                   0                 0                0                0
##    10.4                  0                 0                0                0
##    10.5                  0                 0                0                0
##    11.5                  0                 0                0                0
##    11.8                  0                 0                0                0
##    11.9                  0                 0                0                0
##    12                    0                 0                0                0
##    13.1                  0                 0                0                0
##    13.2                  0                 0                0                0
##    13.5                  0                 0                0                0
##    13.6                  0                 0                0                0
##    13.8                  0                 0                0                0
##    14.3                  0                 0                0                0
##    14.4                  0                 0                0                0
##    14.5                  0                 0                0                0
##    14.6                  0                 0                0                0
##    15.2                  0                 0                0                0
##    15.3                  0                 0                0                0
##    16.1                  0                 0                0                0
##    16.2                  0                 0                0                0
##    16.8                  0                 0                0                0
##    17.1                  0                 0                0                0
##    17.5                  1                 0                0                0
##    17.6                  0                 0                0                0
##    17.8                  0                 0                0                0
##    18.1                  0                 0                0                1
##    18.2                  0                 0                1                0
##    18.5                  0                 0                0                0
##    18.6                  0                 0                0                0
##    18.7                  0                 0                0                0
##    19.2                  0                 0                0                0
##    19.3                  0                 0                0                0
##    19.4                  0                 0                0                0
##    19.6                  0                 0                0                0
##    19.8                  0                 0                0                0
##    19.9                  0                 0                0                0
##    20                    0                 0                0                0
##    20.3                  0                 0                0                0
##    20.5                  0                 0                0                0
```

```
##    20.6                0                1                0                0
##    21.4                0                0                0                0
##    21.6                0                0                0                0
##    21.7                0                0                0                0
##    21.9                0                0                0                0
##    22.5                0                0                0                0
##    22.6                0                0                0                0
##    22.7                0                0                0                0
##    23                  0                0                0                0
##    23.1                0                0                0                0
##    23.4                0                0                0                0
##    23.6                0                0                0                0
##    23.7                0                0                0                0
##    23.8                0                0                0                0
##    23.9                0                0                0                0
##    24.5                0                0                0                0
##    24.7                0                0                0                0
##    25                  0                0                0                0
##    26.4                0                0                0                0
##    26.7                0                0                0                0
##    27.1                0                0                0                0
##    27.5                0                0                0                0
##    27.9                0                0                0                0
##    28.6                0                0                0                0
##    29.6                0                0                0                0
##    29.8                0                0                0                0
##    30.8                0                0                0                0
##    31.6                0                0                0                0
##    33.2                0                0                0                0
##    33.3                0                0                0                0
##    33.4                0                0                0                0
##    34.7                0                0                0                0
##    36                  0                0                0                0
##    36.2                0                0                0                0
##    36.5                0                0                0                0
##    37.3                0                0                0                0
##    41.3                0                0                0                0
##    43.1                0                0                0                0
##    46                  0                0                0                0
##    50                  0                0                0                0
##         pred
## true   18.3790191197475 18.3792215500358 18.4615400276707 18.5727692550048
##    5                   0                0                0                0
##    7                   0                0                0                0
##    7.2                 0                0                0                0
##    8.4                 0                0                0                0
##    8.5                 0                0                0                0
##    10.4                0                0                0                0
##    10.5                0                0                0                0
##    11.5                0                0                0                0
##    11.8                0                0                0                0
##    11.9                0                0                0                0
##    12                  0                0                0                0
##    13.1                0                0                0                0
```

```
## 13.2                    0               0               0               0
## 13.5                    0               0               0               0
## 13.6                    0               0               0               0
## 13.8                    0               0               0               0
## 14.3                    0               0               0               0
## 14.4                    0               0               0               0
## 14.5                    0               0               0               0
## 14.6                    0               0               0               0
## 15.2                    1               0               0               0
## 15.3                    0               0               1               0
## 16.1                    0               0               0               0
## 16.2                    0               0               0               0
## 16.8                    0               0               0               0
## 17.1                    0               0               0               0
## 17.5                    0               0               0               0
## 17.6                    0               0               0               0
## 17.8                    0               0               0               0
## 18.1                    0               0               0               0
## 18.2                    0               0               0               0
## 18.5                    0               1               0               0
## 18.6                    0               0               0               0
## 18.7                    0               0               0               0
## 19.2                    0               0               0               0
## 19.3                    0               0               0               0
## 19.4                    0               0               0               0
## 19.6                    0               0               0               0
## 19.8                    0               0               0               0
## 19.9                    0               0               0               0
## 20                      0               0               0               0
## 20.3                    0               0               0               0
## 20.5                    0               0               0               0
## 20.6                    0               0               0               1
## 21.4                    0               0               0               0
## 21.6                    0               0               0               0
## 21.7                    0               0               0               0
## 21.9                    0               0               0               0
## 22.5                    0               0               0               0
## 22.6                    0               0               0               0
## 22.7                    0               0               0               0
## 23                      0               0               0               0
## 23.1                    0               0               0               0
## 23.4                    0               0               0               0
## 23.6                    0               0               0               0
## 23.7                    0               0               0               0
## 23.8                    0               0               0               0
## 23.9                    0               0               0               0
## 24.5                    0               0               0               0
## 24.7                    0               0               0               0
## 25                      0               0               0               0
## 26.4                    0               0               0               0
## 26.7                    0               0               0               0
## 27.1                    0               0               0               0
## 27.5                    0               0               0               0
## 27.9                    0               0               0               0
```

```
##   28.6                0                0                0                0
##   29.6                0                0                0                0
##   29.8                0                0                0                0
##   30.8                0                0                0                0
##   31.6                0                0                0                0
##   33.2                0                0                0                0
##   33.3                0                0                0                0
##   33.4                0                0                0                0
##   34.7                0                0                0                0
##   36                  0                0                0                0
##   36.2                0                0                0                0
##   36.5                0                0                0                0
##   37.3                0                0                0                0
##   41.3                0                0                0                0
##   43.1                0                0                0                0
##   46                  0                0                0                0
##   50                  0                0                0                0
##       pred
## true   18.6811722436049 18.7529998870447 18.8389126416156 19.0264799743278
##   5                   0                0                0                0
##   7                   0                0                0                0
##   7.2                 0                0                0                0
##   8.4                 0                0                0                0
##   8.5                 0                0                0                0
##   10.4                0                0                0                0
##   10.5                0                0                0                0
##   11.5                0                0                0                0
##   11.8                0                0                0                0
##   11.9                0                0                0                0
##   12                  0                0                0                0
##   13.1                0                0                0                0
##   13.2                0                0                0                0
##   13.5                0                0                0                0
##   13.6                0                0                0                0
##   13.8                0                0                0                0
##   14.3                0                0                0                0
##   14.4                0                0                0                0
##   14.5                0                0                0                0
##   14.6                0                0                0                0
##   15.2                0                0                0                0
##   15.3                0                0                0                0
##   16.1                0                1                0                0
##   16.2                0                0                0                0
##   16.8                0                0                0                0
##   17.1                0                0                0                0
##   17.5                0                0                0                0
##   17.6                0                0                0                0
##   17.8                0                0                0                0
##   18.1                0                0                0                0
##   18.2                0                0                0                0
##   18.5                0                0                0                0
##   18.6                0                0                0                0
##   18.7                0                0                0                0
##   19.2                0                0                0                0
```

```
##   19.3                0               0               0               0
##   19.4                0               0               0               0
##   19.6                0               0               0               0
##   19.8                0               0               0               0
##   19.9                0               0               0               0
##   20                  0               0               0               0
##   20.3                0               0               0               1
##   20.5                0               0               0               0
##   20.6                0               0               1               0
##   21.4                1               0               0               0
##   21.6                0               0               0               0
##   21.7                0               0               0               0
##   21.9                0               0               0               0
##   22.5                0               0               0               0
##   22.6                0               0               0               0
##   22.7                0               0               0               0
##   23                  0               0               0               0
##   23.1                0               0               0               0
##   23.4                0               0               0               0
##   23.6                0               0               0               0
##   23.7                0               0               0               0
##   23.8                0               0               0               0
##   23.9                0               0               0               0
##   24.5                0               0               0               0
##   24.7                0               0               0               0
##   25                  0               0               0               0
##   26.4                0               0               0               0
##   26.7                0               0               0               0
##   27.1                0               0               0               0
##   27.5                0               0               0               0
##   27.9                0               0               0               0
##   28.6                0               0               0               0
##   29.6                0               0               0               0
##   29.8                0               0               0               0
##   30.8                0               0               0               0
##   31.6                0               0               0               0
##   33.2                0               0               0               0
##   33.3                0               0               0               0
##   33.4                0               0               0               0
##   34.7                0               0               0               0
##   36                  0               0               0               0
##   36.2                0               0               0               0
##   36.5                0               0               0               0
##   37.3                0               0               0               0
##   41.3                0               0               0               0
##   43.1                0               0               0               0
##   46                  0               0               0               0
##   50                  0               0               0               0
##       pred
## true   19.2877172922113 19.3039735499474 19.3250712634706 19.4228827064423
##   5                  0               0               0               0
##   7                  0               0               0               0
##   7.2                0               0               0               0
##   8.4                0               0               0               0
```

```
##   8.5                    0               0               0               0
##   10.4                   0               0               0               0
##   10.5                   0               0               0               0
##   11.5                   0               0               0               0
##   11.8                   0               0               0               0
##   11.9                   0               0               0               0
##   12                     0               0               0               0
##   13.1                   0               0               0               0
##   13.2                   0               0               0               0
##   13.5                   0               0               0               0
##   13.6                   0               0               0               0
##   13.8                   0               0               0               0
##   14.3                   0               0               0               0
##   14.4                   0               0               0               0
##   14.5                   0               0               0               0
##   14.6                   0               0               0               0
##   15.2                   0               0               0               0
##   15.3                   0               0               0               0
##   16.1                   0               0               0               0
##   16.2                   0               0               0               0
##   16.8                   0               0               0               0
##   17.1                   0               0               0               0
##   17.5                   0               0               0               0
##   17.6                   0               0               0               0
##   17.8                   0               0               0               0
##   18.1                   0               0               0               0
##   18.2                   0               0               0               0
##   18.5                   0               0               0               0
##   18.6                   0               1               0               0
##   18.7                   0               0               0               0
##   19.2                   0               0               0               0
##   19.3                   0               0               0               0
##   19.4                   0               0               0               0
##   19.6                   0               0               0               1
##   19.8                   0               0               0               0
##   19.9                   0               0               1               0
##   20                     0               0               0               0
##   20.3                   0               0               0               0
##   20.5                   1               0               0               0
##   20.6                   0               0               0               0
##   21.4                   0               0               0               0
##   21.6                   0               0               0               0
##   21.7                   0               0               0               0
##   21.9                   0               0               0               0
##   22.5                   0               0               0               0
##   22.6                   0               0               0               0
##   22.7                   0               0               0               0
##   23                     0               0               0               0
##   23.1                   0               0               0               0
##   23.4                   0               0               0               0
##   23.6                   0               0               0               0
##   23.7                   0               0               0               0
##   23.8                   0               0               0               0
##   23.9                   0               0               0               0
```

```
##   24.5              0              0              0              0
##   24.7              0              0              0              0
##   25                0              0              0              0
##   26.4              0              0              0              0
##   26.7              0              0              0              0
##   27.1              0              0              0              0
##   27.5              0              0              0              0
##   27.9              0              0              0              0
##   28.6              0              0              0              0
##   29.6              0              0              0              0
##   29.8              0              0              0              0
##   30.8              0              0              0              0
##   31.6              0              0              0              0
##   33.2              0              0              0              0
##   33.3              0              0              0              0
##   33.4              0              0              0              0
##   34.7              0              0              0              0
##   36                0              0              0              0
##   36.2              0              0              0              0
##   36.5              0              0              0              0
##   37.3              0              0              0              0
##   41.3              0              0              0              0
##   43.1              0              0              0              0
##   46                0              0              0              0
##   50                0              0              0              0
##        pred
## true    19.5361670193823 19.817306372635 19.9493237929456 20.0746457315118
##   5                0              0              0              0
##   7                0              0              0              0
##   7.2              0              0              0              0
##   8.4              0              0              0              0
##   8.5              0              0              0              0
##   10.4             0              0              0              0
##   10.5             0              0              0              0
##   11.5             0              0              0              0
##   11.8             0              0              0              0
##   11.9             0              0              0              0
##   12               0              0              0              0
##   13.1             0              0              0              0
##   13.2             0              0              0              0
##   13.5             0              0              0              0
##   13.6             0              0              0              0
##   13.8             0              0              0              0
##   14.3             0              0              0              0
##   14.4             0              0              0              0
##   14.5             0              0              0              0
##   14.6             0              0              0              0
##   15.2             0              0              0              0
##   15.3             0              0              0              0
##   16.1             0              0              0              0
##   16.2             0              0              0              0
##   16.8             0              0              0              1
##   17.1             0              1              0              0
##   17.5             0              0              0              0
```

```
##   17.6                    0              0              0              0
##   17.8                    0              0              0              0
##   18.1                    0              0              0              0
##   18.2                    0              0              0              0
##   18.5                    0              0              0              0
##   18.6                    0              0              0              0
##   18.7                    0              0              1              0
##   19.2                    0              0              0              0
##   19.3                    0              0              0              0
##   19.4                    1              0              0              0
##   19.6                    0              0              0              0
##   19.8                    0              0              0              0
##   19.9                    0              0              0              0
##   20                      0              0              0              0
##   20.3                    0              0              0              0
##   20.5                    0              0              0              0
##   20.6                    0              0              0              0
##   21.4                    0              0              0              0
##   21.6                    0              0              0              0
##   21.7                    0              0              0              0
##   21.9                    0              0              0              0
##   22.5                    0              0              0              0
##   22.6                    0              0              0              0
##   22.7                    0              0              0              0
##   23                      0              0              0              0
##   23.1                    0              0              0              0
##   23.4                    0              0              0              0
##   23.6                    0              0              0              0
##   23.7                    0              0              0              0
##   23.8                    0              0              0              0
##   23.9                    0              0              0              0
##   24.5                    0              0              0              0
##   24.7                    0              0              0              0
##   25                      0              0              0              0
##   26.4                    0              0              0              0
##   26.7                    0              0              0              0
##   27.1                    0              0              0              0
##   27.5                    0              0              0              0
##   27.9                    0              0              0              0
##   28.6                    0              0              0              0
##   29.6                    0              0              0              0
##   29.8                    0              0              0              0
##   30.8                    0              0              0              0
##   31.6                    0              0              0              0
##   33.2                    0              0              0              0
##   33.3                    0              0              0              0
##   33.4                    0              0              0              0
##   34.7                    0              0              0              0
##   36                      0              0              0              0
##   36.2                    0              0              0              0
##   36.5                    0              0              0              0
##   37.3                    0              0              0              0
##   41.3                    0              0              0              0
##   43.1                    0              0              0              0
```

```
##   46                0               0              0               0
##   50                0               0              0               0
##       pred
## true   20.4567572656505 20.5458315045789 20.62709112141 20.7601761831815
##   5                 0               0              0               0
##   7                 0               0              0               0
##   7.2               0               0              0               0
##   8.4               0               0              0               0
##   8.5               0               0              0               0
##   10.4              0               0              0               0
##   10.5              0               0              0               0
##   11.5              0               0              0               0
##   11.8              0               0              0               0
##   11.9              0               0              0               0
##   12                0               0              0               0
##   13.1              0               0              0               0
##   13.2              0               0              0               0
##   13.5              0               0              0               0
##   13.6              0               0              0               0
##   13.8              0               0              0               0
##   14.3              0               0              0               0
##   14.4              0               0              0               0
##   14.5              0               0              0               0
##   14.6              0               0              0               0
##   15.2              0               0              0               0
##   15.3              0               0              0               0
##   16.1              0               0              0               0
##   16.2              0               0              0               0
##   16.8              0               0              0               0
##   17.1              0               0              0               0
##   17.5              0               0              0               0
##   17.6              0               0              0               0
##   17.8              0               0              0               0
##   18.1              0               0              0               0
##   18.2              0               0              0               0
##   18.5              0               0              0               0
##   18.6              0               0              0               0
##   18.7              0               0              0               0
##   19.2              0               0              0               0
##   19.3              0               0              0               0
##   19.4              0               0              0               0
##   19.6              0               0              0               0
##   19.8              0               0              0               0
##   19.9              0               0              0               0
##   20                0               0              0               0
##   20.3              0               0              0               1
##   20.5              0               0              0               0
##   20.6              0               0              0               0
##   21.4              0               0              0               0
##   21.6              0               0              0               0
##   21.7              0               0              1               0
##   21.9              0               0              0               0
##   22.5              0               0              0               0
##   22.6              0               0              0               0
```

```
##   22.7                 0              0              0              0
##   23                   1              0              0              0
##   23.1                 0              0              0              0
##   23.4                 0              0              0              0
##   23.6                 0              0              0              0
##   23.7                 0              0              0              0
##   23.8                 0              0              0              0
##   23.9                 0              0              0              0
##   24.5                 0              0              0              0
##   24.7                 0              0              0              0
##   25                   0              0              0              0
##   26.4                 0              0              0              0
##   26.7                 0              0              0              0
##   27.1                 0              0              0              0
##   27.5                 0              0              0              0
##   27.9                 0              0              0              0
##   28.6                 0              0              0              0
##   29.6                 0              0              0              0
##   29.8                 0              0              0              0
##   30.8                 0              0              0              0
##   31.6                 0              0              0              0
##   33.2                 0              0              0              0
##   33.3                 0              0              0              0
##   33.4                 0              0              0              0
##   34.7                 0              0              0              0
##   36                   0              0              0              0
##   36.2                 0              0              0              0
##   36.5                 0              0              0              0
##   37.3                 0              0              0              0
##   41.3                 0              0              0              0
##   43.1                 0              0              0              0
##   46                   0              0              0              0
##   50                   0              1              0              0
##        pred
## true   21.0170203642219 21.4611536252493 21.8155588631301 21.860119286782
##   5                    0              0              0              0
##   7                    0              0              0              0
##   7.2                  0              0              0              0
##   8.4                  0              0              0              0
##   8.5                  0              0              0              0
##   10.4                 0              0              0              0
##   10.5                 0              0              0              0
##   11.5                 0              0              0              0
##   11.8                 0              0              0              0
##   11.9                 0              1              0              0
##   12                   0              0              0              0
##   13.1                 0              0              0              0
##   13.2                 0              0              0              0
##   13.5                 0              0              0              0
##   13.6                 0              0              0              0
##   13.8                 0              0              0              0
##   14.3                 0              0              0              0
##   14.4                 0              0              0              0
##   14.5                 0              0              0              0
```

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```
## 14.6                0             0             0             0
## 15.2                0             0             0             0
## 15.3                0             0             0             0
## 16.1                0             0             0             0
## 16.2                0             0             0             0
## 16.8                0             0             0             0
## 17.1                0             0             0             0
## 17.5                0             0             0             0
## 17.6                0             0             0             0
## 17.8                0             0             0             0
## 18.1                0             0             0             0
## 18.2                0             0             0             0
## 18.5                0             0             0             0
## 18.6                0             0             0             0
## 18.7                0             0             0             0
## 19.2                0             0             0             0
## 19.3                0             0             0             1
## 19.4                0             0             0             0
## 19.6                0             0             0             0
## 19.8                0             0             1             0
## 19.9                0             0             0             0
## 20                  0             0             0             0
## 20.3                0             0             0             0
## 20.5                0             0             0             0
## 20.6                0             0             0             0
## 21.4                0             0             0             0
## 21.6                0             0             0             0
## 21.7                0             0             0             0
## 21.9                0             0             0             0
## 22.5                0             0             0             0
## 22.6                0             0             0             0
## 22.7                0             0             0             0
## 23                  0             0             0             0
## 23.1                0             0             0             0
## 23.4                0             0             0             0
## 23.6                0             0             0             0
## 23.7                0             0             0             0
## 23.8                0             0             0             0
## 23.9                0             0             0             0
## 24.5                1             0             0             0
## 24.7                0             0             0             0
## 25                  0             0             0             0
## 26.4                0             0             0             0
## 26.7                0             0             0             0
## 27.1                0             0             0             0
## 27.5                0             0             0             0
## 27.9                0             0             0             0
## 28.6                0             0             0             0
## 29.6                0             0             0             0
## 29.8                0             0             0             0
## 30.8                0             0             0             0
## 31.6                0             0             0             0
## 33.2                0             0             0             0
## 33.3                0             0             0             0
```

```
##    33.4               0               0               0               0
##    34.7               0               0               0               0
##    36                 0               0               0               0
##    36.2               0               0               0               0
##    36.5               0               0               0               0
##    37.3               0               0               0               0
##    41.3               0               0               0               0
##    43.1               0               0               0               0
##    46                 0               0               0               0
##    50                 0               0               0               0
##        pred
## true   22.0942047104276 22.2763520968835 23.3313833480029 23.4133959051298
##    5                  0                0                0                0
##    7                  0                0                0                0
##    7.2                0                0                0                0
##    8.4                0                0                0                0
##    8.5                0                0                0                0
##    10.4               0                0                0                0
##    10.5               0                0                0                0
##    11.5               0                0                0                0
##    11.8               0                0                0                0
##    11.9               0                0                0                0
##    12                 0                0                0                0
##    13.1               0                0                0                0
##    13.2               0                0                0                0
##    13.5               0                0                0                0
##    13.6               0                0                0                0
##    13.8               0                0                0                0
##    14.3               0                0                0                0
##    14.4               0                0                0                0
##    14.5               0                0                0                0
##    14.6               0                0                0                0
##    15.2               0                0                0                0
##    15.3               0                0                0                0
##    16.1               0                0                0                0
##    16.2               0                0                0                0
##    16.8               0                0                0                0
##    17.1               0                0                0                0
##    17.5               0                0                0                0
##    17.6               0                0                0                0
##    17.8               0                0                0                0
##    18.1               0                0                0                0
##    18.2               0                0                0                0
##    18.5               0                0                0                0
##    18.6               0                0                0                0
##    18.7               0                0                0                0
##    19.2               1                0                0                0
##    19.3               0                0                0                0
##    19.4               0                0                0                0
##    19.6               0                0                0                0
##    19.8               0                0                0                0
##    19.9               0                0                0                0
##    20                 0                0                0                0
##    20.3               0                0                0                0
```

```
##   20.5               0               0               0               0
##   20.6               0               0               0               0
##   21.4               0               0               0               1
##   21.6               0               0               0               0
##   21.7               0               0               0               0
##   21.9               0               0               0               0
##   22.5               0               0               0               0
##   22.6               0               0               0               0
##   22.7               0               1               0               0
##   23                 0               0               0               0
##   23.1               0               0               0               0
##   23.4               0               0               0               0
##   23.6               0               0               0               0
##   23.7               0               0               0               0
##   23.8               0               0               0               0
##   23.9               0               0               0               0
##   24.5               0               0               0               0
##   24.7               0               0               0               0
##   25                 0               0               0               0
##   26.4               0               0               0               0
##   26.7               0               0               0               0
##   27.1               0               0               0               0
##   27.5               0               0               0               0
##   27.9               0               0               0               0
##   28.6               0               0               0               0
##   29.6               0               0               1               0
##   29.8               0               0               0               0
##   30.8               0               0               0               0
##   31.6               0               0               0               0
##   33.2               0               0               0               0
##   33.3               0               0               0               0
##   33.4               0               0               0               0
##   34.7               0               0               0               0
##   36                 0               0               0               0
##   36.2               0               0               0               0
##   36.5               0               0               0               0
##   37.3               0               0               0               0
##   41.3               0               0               0               0
##   43.1               0               0               0               0
##   46                 0               0               0               0
##   50                 0               0               0               0
##       pred
## true   23.7357888799305 23.7700409928669 23.8257373008024 24.2166109144559
##   5                  0               0               0               0
##   7                  0               0               0               0
##   7.2                0               0               0               0
##   8.4                0               0               0               0
##   8.5                0               0               0               0
##   10.4               0               0               0               0
##   10.5               0               0               0               0
##   11.5               0               0               0               0
##   11.8               0               0               0               0
##   11.9               0               0               0               0
##   12                 0               0               0               0
```

```
##   13.1                  0                    0                   0                   0
##   13.2                  0                    0                   0                   0
##   13.5                  0                    0                   0                   0
##   13.6                  0                    0                   0                   0
##   13.8                  0                    0                   0                   0
##   14.3                  0                    0                   0                   0
##   14.4                  0                    0                   0                   0
##   14.5                  0                    0                   0                   0
##   14.6                  0                    0                   0                   0
##   15.2                  0                    0                   0                   0
##   15.3                  0                    0                   0                   0
##   16.1                  0                    0                   0                   0
##   16.2                  0                    0                   0                   0
##   16.8                  0                    0                   0                   0
##   17.1                  0                    0                   0                   0
##   17.5                  0                    0                   0                   0
##   17.6                  0                    0                   0                   0
##   17.8                  0                    0                   0                   0
##   18.1                  0                    0                   0                   0
##   18.2                  0                    0                   0                   0
##   18.5                  0                    0                   0                   0
##   18.6                  0                    0                   0                   0
##   18.7                  0                    0                   0                   0
##   19.2                  0                    0                   0                   0
##   19.3                  0                    0                   0                   0
##   19.4                  0                    0                   0                   0
##   19.6                  0                    0                   0                   0
##   19.8                  0                    0                   0                   0
##   19.9                  0                    0                   0                   0
##   20                    0                    0                   0                   0
##   20.3                  0                    0                   0                   0
##   20.5                  0                    0                   0                   0
##   20.6                  0                    0                   0                   0
##   21.4                  0                    0                   0                   0
##   21.6                  0                    1                   0                   0
##   21.7                  0                    0                   0                   0
##   21.9                  0                    0                   0                   0
##   22.5                  0                    0                   0                   0
##   22.6                  0                    0                   0                   0
##   22.7                  0                    0                   0                   0
##   23                    0                    0                   1                   0
##   23.1                  0                    0                   0                   0
##   23.4                  0                    0                   0                   0
##   23.6                  0                    0                   0                   0
##   23.7                  0                    0                   0                   0
##   23.8                  0                    0                   0                   1
##   23.9                  0                    0                   0                   0
##   24.5                  0                    0                   0                   0
##   24.7                  0                    0                   0                   0
##   25                    0                    0                   0                   0
##   26.4                  0                    0                   0                   0
##   26.7                  0                    0                   0                   0
##   27.1                  0                    0                   0                   0
##   27.5                  0                    0                   0                   0
```

```
##    27.9                0                0                0                0
##    28.6                0                0                0                0
##    29.6                0                0                0                0
##    29.8                1                0                0                0
##    30.8                0                0                0                0
##    31.6                0                0                0                0
##    33.2                0                0                0                0
##    33.3                0                0                0                0
##    33.4                0                0                0                0
##    34.7                0                0                0                0
##    36                  0                0                0                0
##    36.2                0                0                0                0
##    36.5                0                0                0                0
##    37.3                0                0                0                0
##    41.3                0                0                0                0
##    43.1                0                0                0                0
##    46                  0                0                0                0
##    50                  0                0                0                0
##         pred
## true   24.3241778604328 24.6860393937465 25.1192696444818 25.5126311382421
##    5                   0                0                0                0
##    7                   0                0                0                0
##    7.2                 0                0                0                0
##    8.4                 0                0                0                0
##    8.5                 0                0                0                0
##    10.4                0                0                0                0
##    10.5                0                0                0                0
##    11.5                0                0                0                0
##    11.8                0                0                0                0
##    11.9                0                0                0                0
##    12                  0                0                0                0
##    13.1                0                0                0                0
##    13.2                0                0                0                0
##    13.5                0                0                0                0
##    13.6                0                0                0                0
##    13.8                0                0                0                0
##    14.3                0                0                0                0
##    14.4                0                0                0                0
##    14.5                0                0                0                0
##    14.6                0                0                0                0
##    15.2                0                0                0                0
##    15.3                0                0                0                0
##    16.1                0                0                0                0
##    16.2                0                0                0                0
##    16.8                0                0                0                0
##    17.1                0                0                0                0
##    17.5                0                0                0                0
##    17.6                0                0                0                0
##    17.8                0                0                0                0
##    18.1                0                0                0                0
##    18.2                0                0                0                0
##    18.5                0                0                0                0
##    18.6                0                0                0                0
##    18.7                0                0                0                0
```

```
## 19.2                    0                   0                   0                   0
## 19.3                    0                   0                   0                   0
## 19.4                    0                   0                   0                   0
## 19.6                    0                   0                   0                   0
## 19.8                    0                   0                   0                   0
## 19.9                    0                   0                   0                   0
## 20                      0                   0                   0                   0
## 20.3                    0                   0                   0                   0
## 20.5                    0                   0                   0                   0
## 20.6                    0                   0                   0                   0
## 21.4                    0                   0                   0                   0
## 21.6                    0                   0                   0                   0
## 21.7                    0                   0                   0                   0
## 21.9                    0                   0                   0                   0
## 22.5                    0                   0                   0                   0
## 22.6                    0                   0                   0                   0
## 22.7                    0                   0                   0                   0
## 23                      0                   0                   0                   0
## 23.1                    0                   0                   0                   0
## 23.4                    1                   0                   0                   0
## 23.6                    0                   0                   0                   0
## 23.7                    0                   0                   0                   0
## 23.8                    0                   0                   0                   0
## 23.9                    0                   0                   0                   1
## 24.5                    0                   0                   0                   0
## 24.7                    0                   0                   1                   0
## 25                      0                   1                   0                   0
## 26.4                    0                   0                   0                   0
## 26.7                    0                   0                   0                   0
## 27.1                    0                   0                   0                   0
## 27.5                    0                   0                   0                   0
## 27.9                    0                   0                   0                   0
## 28.6                    0                   0                   0                   0
## 29.6                    0                   0                   0                   0
## 29.8                    0                   0                   0                   0
## 30.8                    0                   0                   0                   0
## 31.6                    0                   0                   0                   0
## 33.2                    0                   0                   0                   0
## 33.3                    0                   0                   0                   0
## 33.4                    0                   0                   0                   0
## 34.7                    0                   0                   0                   0
## 36                      0                   0                   0                   0
## 36.2                    0                   0                   0                   0
## 36.5                    0                   0                   0                   0
## 37.3                    0                   0                   0                   0
## 41.3                    0                   0                   0                   0
## 43.1                    0                   0                   0                   0
## 46                      0                   0                   0                   0
## 50                      0                   0                   0                   0
##       pred
## true   25.6846767587885 26.0580928313281 26.3782541042592 26.9896066856322
## 5                       0                   0                   0                   0
## 7                       0                   0                   0                   0
## 7.2                     0                   0                   0                   0
```

```
## 8.4     0     0     0     0
## 8.5     0     0     0     0
## 10.4    0     0     0     0
## 10.5    0     0     0     0
## 11.5    0     0     0     0
## 11.8    0     0     0     0
## 11.9    0     0     0     0
## 12      0     0     0     0
## 13.1    0     0     0     0
## 13.2    0     0     0     0
## 13.5    0     0     0     0
## 13.6    0     0     0     0
## 13.8    0     0     0     0
## 14.3    0     0     0     0
## 14.4    0     0     0     0
## 14.5    0     0     0     0
## 14.6    0     0     0     0
## 15.2    0     0     0     0
## 15.3    0     0     0     0
## 16.1    0     0     0     0
## 16.2    0     0     0     0
## 16.8    0     0     0     0
## 17.1    0     0     0     0
## 17.5    0     0     0     0
## 17.6    0     0     0     0
## 17.8    0     0     0     0
## 18.1    0     0     0     0
## 18.2    0     0     0     0
## 18.5    0     0     0     0
## 18.6    0     0     0     0
## 18.7    0     0     0     0
## 19.2    0     0     0     0
## 19.3    0     0     0     0
## 19.4    0     0     0     0
## 19.6    0     0     0     0
## 19.8    0     0     0     0
## 19.9    0     0     0     0
## 20      0     0     0     0
## 20.3    0     0     0     0
## 20.5    0     0     0     0
## 20.6    0     0     0     0
## 21.4    0     0     0     0
## 21.6    0     0     0     0
## 21.7    0     0     0     0
## 21.9    0     0     0     0
## 22.5    0     0     0     0
## 22.6    0     0     0     0
## 22.7    0     0     0     0
## 23      0     0     1     0
## 23.1    1     0     0     0
## 23.4    0     0     0     0
## 23.6    0     0     0     0
## 23.7    0     0     0     0
## 23.8    0     0     0     0
```

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```
##   23.9               0               0               0               0
##   24.5               0               0               0               0
##   24.7               0               0               0               0
##   25                 0               0               0               0
##   26.4               0               0               0               0
##   26.7               0               0               0               0
##   27.1               0               1               0               0
##   27.5               0               0               0               0
##   27.9               0               0               0               0
##   28.6               0               0               0               0
##   29.6               0               0               0               0
##   29.8               0               0               0               0
##   30.8               0               0               0               0
##   31.6               0               0               0               0
##   33.2               0               0               0               0
##   33.3               0               0               0               0
##   33.4               0               0               0               0
##   34.7               0               0               0               0
##   36                 0               0               0               0
##   36.2               0               0               0               0
##   36.5               0               0               0               0
##   37.3               0               0               0               0
##   41.3               0               0               0               0
##   43.1               0               0               0               0
##   46                 0               0               0               0
##   50                 0               0               0               1
##      pred
## true  27.6503088346345 27.8253606417223 27.9548745817116 27.9608895401666
##   5                  0               0               0               0
##   7                  0               0               0               0
##   7.2                0               0               0               0
##   8.4                0               0               0               0
##   8.5                0               0               0               0
##   10.4               0               0               0               0
##   10.5               0               0               0               0
##   11.5               0               0               0               0
##   11.8               0               0               0               0
##   11.9               0               0               0               0
##   12                 0               0               0               0
##   13.1               0               0               0               0
##   13.2               0               0               0               0
##   13.5               0               0               0               0
##   13.6               0               0               0               0
##   13.8               0               0               0               0
##   14.3               0               0               0               0
##   14.4               0               0               0               0
##   14.5               0               0               0               0
##   14.6               0               0               0               0
##   15.2               0               0               0               0
##   15.3               0               0               0               0
##   16.1               0               0               0               0
##   16.2               0               0               0               0
##   16.8               0               0               0               0
##   17.1               0               0               0               0
```

```
##  17.5                   0               0               0               0
##  17.6                   0               0               0               0
##  17.8                   0               0               0               0
##  18.1                   0               0               0               0
##  18.2                   0               0               0               0
##  18.5                   0               0               0               0
##  18.6                   0               0               0               0
##  18.7                   0               0               0               0
##  19.2                   0               0               0               0
##  19.3                   0               0               0               0
##  19.4                   0               0               0               0
##  19.6                   0               0               0               0
##  19.8                   0               0               0               0
##  19.9                   0               0               0               0
##  20                     0               0               0               0
##  20.3                   0               0               0               0
##  20.5                   0               0               0               0
##  20.6                   0               0               0               0
##  21.4                   0               0               0               0
##  21.6                   0               0               0               0
##  21.7                   0               0               0               0
##  21.9                   0               0               0               0
##  22.5                   0               0               0               1
##  22.6                   0               0               0               0
##  22.7                   0               0               0               0
##  23                     0               0               0               0
##  23.1                   0               0               0               0
##  23.4                   0               0               0               0
##  23.6                   0               0               0               0
##  23.7                   0               0               0               0
##  23.8                   0               0               0               0
##  23.9                   0               0               0               0
##  24.5                   0               0               0               0
##  24.7                   0               0               0               0
##  25                     0               0               0               0
##  26.4                   0               1               0               0
##  26.7                   0               0               0               0
##  27.1                   0               0               0               0
##  27.5                   0               0               0               0
##  27.9                   0               0               0               0
##  28.6                   1               0               0               0
##  29.6                   0               0               0               0
##  29.8                   0               0               0               0
##  30.8                   0               0               0               0
##  31.6                   0               0               0               0
##  33.2                   0               0               0               0
##  33.3                   0               0               0               0
##  33.4                   0               0               0               0
##  34.7                   0               0               0               0
##  36                     0               0               0               0
##  36.2                   0               0               1               0
##  36.5                   0               0               0               0
##  37.3                   0               0               0               0
##  41.3                   0               0               0               0
```

```
##   43.1                0              0              0              0
##   46                  0              0              0              0
##   50                  0              0              0              0
##      pred
## true   28.2897589632531 28.9188570294383 29.695903139989 29.7622576307781
##   5                    0              0              0              0
##   7                    0              0              0              0
##   7.2                  0              0              0              0
##   8.4                  0              0              0              0
##   8.5                  0              0              0              0
##   10.4                 0              0              0              0
##   10.5                 0              0              0              0
##   11.5                 0              0              0              0
##   11.8                 0              0              0              0
##   11.9                 0              0              0              0
##   12                   0              0              0              0
##   13.1                 0              0              0              0
##   13.2                 0              0              0              0
##   13.5                 0              0              0              0
##   13.6                 0              0              0              0
##   13.8                 0              0              0              0
##   14.3                 0              0              0              0
##   14.4                 0              0              0              0
##   14.5                 0              0              0              0
##   14.6                 0              0              0              0
##   15.2                 0              0              0              0
##   15.3                 0              0              0              0
##   16.1                 0              0              0              0
##   16.2                 0              0              0              0
##   16.8                 0              0              0              0
##   17.1                 0              0              0              0
##   17.5                 0              0              0              0
##   17.6                 0              0              0              0
##   17.8                 0              0              0              0
##   18.1                 0              0              0              0
##   18.2                 0              0              0              0
##   18.5                 0              0              0              0
##   18.6                 0              0              0              0
##   18.7                 0              0              0              0
##   19.2                 0              0              0              0
##   19.3                 0              0              0              0
##   19.4                 0              0              0              0
##   19.6                 0              0              0              0
##   19.8                 0              0              0              0
##   19.9                 0              0              0              0
##   20                   0              0              0              0
##   20.3                 0              0              0              0
##   20.5                 0              0              0              0
##   20.6                 0              0              0              0
##   21.4                 0              0              0              0
##   21.6                 0              0              0              0
##   21.7                 0              0              0              0
##   21.9                 0              0              0              0
##   22.5                 0              0              0              0
```

```
##    22.6                  0            0            0            0
##    22.7                  0            0            0            0
##    23                    0            0            0            0
##    23.1                  0            0            0            0
##    23.4                  0            0            0            0
##    23.6                  0            1            0            0
##    23.7                  0            0            0            0
##    23.8                  0            0            0            0
##    23.9                  0            0            0            0
##    24.5                  0            0            0            0
##    24.7                  0            0            0            0
##    25                    0            0            0            0
##    26.4                  0            0            0            0
##    26.7                  0            0            0            1
##    27.1                  0            0            0            0
##    27.5                  0            0            0            0
##    27.9                  0            0            0            0
##    28.6                  0            0            0            0
##    29.6                  0            0            0            0
##    29.8                  0            0            0            0
##    30.8                  0            0            0            0
##    31.6                  0            0            0            0
##    33.2                  0            0            0            0
##    33.3                  0            0            0            0
##    33.4                  1            0            0            0
##    34.7                  0            0            1            0
##    36                    0            0            0            0
##    36.2                  0            0            0            0
##    36.5                  0            0            0            0
##    37.3                  0            0            0            0
##    41.3                  0            0            0            0
##    43.1                  0            0            0            0
##    46                    0            0            0            0
##    50                    0            0            0            0
##        pred
## true   29.7991158711928 29.9823899424472 30.0829210539215 31.4173693221973
##    5                    0            0            0            0
##    7                    0            0            0            0
##    7.2                  0            0            0            0
##    8.4                  0            0            0            0
##    8.5                  0            0            0            0
##    10.4                 0            0            0            0
##    10.5                 0            0            0            0
##    11.5                 0            0            0            0
##    11.8                 0            0            0            0
##    11.9                 0            0            0            0
##    12                   0            0            0            0
##    13.1                 0            0            0            0
##    13.2                 0            0            0            0
##    13.5                 0            0            0            0
##    13.6                 0            0            0            0
##    13.8                 0            0            0            0
##    14.3                 0            0            0            0
##    14.4                 0            0            0            0
```

```
## 14.5               0             0             0             0
## 14.6               0             0             0             0
## 15.2               0             0             0             0
## 15.3               0             0             0             0
## 16.1               0             0             0             0
## 16.2               0             0             0             0
## 16.8               0             0             0             0
## 17.1               0             0             0             0
## 17.5               0             0             0             0
## 17.6               0             0             0             0
## 17.8               0             0             0             0
## 18.1               0             0             0             0
## 18.2               0             0             0             0
## 18.5               0             0             0             0
## 18.6               0             0             0             0
## 18.7               0             0             0             0
## 19.2               0             0             0             0
## 19.3               0             0             0             0
## 19.4               0             0             0             0
## 19.6               0             0             0             0
## 19.8               0             0             0             0
## 19.9               0             0             0             0
## 20                 0             0             0             0
## 20.3               0             0             0             0
## 20.5               0             0             0             0
## 20.6               0             0             0             0
## 21.4               0             0             0             0
## 21.6               0             0             0             0
## 21.7               0             0             0             0
## 21.9               0             0             0             0
## 22.5               0             0             0             0
## 22.6               0             0             0             0
## 22.7               0             0             0             0
## 23                 0             0             0             0
## 23.1               0             0             0             0
## 23.4               0             0             0             0
## 23.6               0             0             0             0
## 23.7               0             0             0             0
## 23.8               0             0             0             0
## 23.9               0             0             0             0
## 24.5               0             0             0             0
## 24.7               0             0             0             0
## 25                 0             0             0             0
## 26.4               0             0             0             0
## 26.7               0             0             0             0
## 27.1               0             0             0             0
## 27.5               0             0             0             0
## 27.9               0             0             0             0
## 28.6               0             0             0             0
## 29.6               0             0             0             0
## 29.8               0             0             0             0
## 30.8               0             1             0             0
## 31.6               1             0             0             0
## 33.2               0             0             0             1
```

```
##   33.3                 0              0                0                0
##   33.4                 0              0                0                0
##   34.7                 0              0                0                0
##   36                   0              0                0                0
##   36.2                 0              0                0                0
##   36.5                 0              0                0                0
##   37.3                 0              0                0                0
##   41.3                 0              0                1                0
##   43.1                 0              0                0                0
##   46                   0              0                0                0
##   50                   0              0                0                0
##      pred
## true  32.7473362739895 33.0528164671315 33.5057609871061 34.6953682090184
##   5                    0                0                0                0
##   7                    0                0                0                0
##   7.2                  0                0                0                0
##   8.4                  0                0                0                0
##   8.5                  0                0                0                0
##   10.4                 0                0                0                0
##   10.5                 0                0                0                0
##   11.5                 0                0                0                0
##   11.8                 0                0                0                0
##   11.9                 0                0                0                0
##   12                   0                0                0                0
##   13.1                 0                0                0                0
##   13.2                 0                0                0                0
##   13.5                 0                0                0                0
##   13.6                 0                0                0                0
##   13.8                 0                0                0                0
##   14.3                 0                0                0                0
##   14.4                 0                0                0                0
##   14.5                 0                0                0                0
##   14.6                 0                0                0                0
##   15.2                 0                0                0                0
##   15.3                 0                0                0                0
##   16.1                 0                0                0                0
##   16.2                 0                0                0                0
##   16.8                 0                0                0                0
##   17.1                 0                0                0                0
##   17.5                 0                0                0                0
##   17.6                 0                0                0                0
##   17.8                 0                0                0                0
##   18.1                 0                0                0                0
##   18.2                 0                0                0                0
##   18.5                 0                0                0                0
##   18.6                 0                0                0                0
##   18.7                 0                0                0                0
##   19.2                 0                0                0                0
##   19.3                 0                0                0                0
##   19.4                 0                0                0                0
##   19.6                 0                0                0                0
##   19.8                 0                0                0                0
##   19.9                 0                0                0                0
##   20                   0                0                0                0
```

```
##   20.3                  0               0               0               0
##   20.5                  0               0               0               0
##   20.6                  0               0               0               0
##   21.4                  0               0               0               0
##   21.6                  0               0               0               0
##   21.7                  0               0               0               0
##   21.9                  0               0               0               0
##   22.5                  0               0               0               0
##   22.6                  0               0               0               0
##   22.7                  0               0               0               0
##   23                    0               0               0               0
##   23.1                  0               0               0               0
##   23.4                  0               0               0               0
##   23.6                  0               0               0               0
##   23.7                  0               0               0               0
##   23.8                  0               0               0               0
##   23.9                  0               0               0               0
##   24.5                  0               0               0               0
##   24.7                  0               0               0               0
##   25                    0               0               0               0
##   26.4                  0               0               0               0
##   26.7                  0               0               0               0
##   27.1                  0               0               0               0
##   27.5                  0               0               0               0
##   27.9                  0               0               0               0
##   28.6                  0               0               0               0
##   29.6                  0               0               0               0
##   29.8                  0               0               0               0
##   30.8                  0               0               0               0
##   31.6                  0               0               0               0
##   33.2                  0               0               0               0
##   33.3                  0               0               0               0
##   33.4                  0               0               0               0
##   34.7                  0               0               0               0
##   36                    0               0               1               0
##   36.2                  0               0               0               0
##   36.5                  0               1               0               0
##   37.3                  1               0               0               0
##   41.3                  0               0               0               0
##   43.1                  0               0               0               1
##   46                    0               0               0               0
##   50                    0               0               0               0
##        pred
## true    34.8679018594909 37.2763681697903 38.1179762470672 41.46515907833
##   5                     0               0               0               0
##   7                     0               0               0               0
##   7.2                   0               0               0               0
##   8.4                   0               0               0               0
##   8.5                   0               0               0               0
##   10.4                  0               0               0               0
##   10.5                  0               0               0               0
##   11.5                  0               0               0               0
##   11.8                  0               0               0               0
##   11.9                  0               0               0               0
```

```
## 12                     0              0              0              0
## 13.1                   0              0              0              0
## 13.2                   0              0              0              0
## 13.5                   0              0              0              0
## 13.6                   0              0              0              0
## 13.8                   0              0              0              0
## 14.3                   0              0              0              0
## 14.4                   0              0              0              0
## 14.5                   0              0              0              0
## 14.6                   0              0              0              0
## 15.2                   0              0              0              0
## 15.3                   0              0              0              0
## 16.1                   0              0              0              0
## 16.2                   0              0              0              0
## 16.8                   0              0              0              0
## 17.1                   0              0              0              0
## 17.5                   0              0              0              0
## 17.6                   0              0              0              0
## 17.8                   0              0              0              0
## 18.1                   0              0              0              0
## 18.2                   0              0              0              0
## 18.5                   0              0              0              0
## 18.6                   0              0              0              0
## 18.7                   0              0              0              0
## 19.2                   0              0              0              0
## 19.3                   0              0              0              0
## 19.4                   0              0              0              0
## 19.6                   0              0              0              0
## 19.8                   0              0              0              0
## 19.9                   0              0              0              0
## 20                     0              0              0              0
## 20.3                   0              0              0              0
## 20.5                   0              0              0              0
## 20.6                   0              0              0              0
## 21.4                   0              0              0              0
## 21.6                   0              0              0              0
## 21.7                   0              0              0              0
## 21.9                   0              0              0              0
## 22.5                   0              0              0              0
## 22.6                   0              0              0              0
## 22.7                   0              0              0              0
## 23                     0              0              0              0
## 23.1                   0              0              0              0
## 23.4                   0              0              0              0
## 23.6                   0              0              0              0
## 23.7                   0              0              0              0
## 23.8                   0              0              0              0
## 23.9                   0              0              0              0
## 24.5                   0              0              0              0
## 24.7                   0              0              0              0
## 25                     0              0              0              0
## 26.4                   0              0              0              0
## 26.7                   0              0              0              0
## 27.1                   0              0              0              0
```

```
##   27.5                 0                0                0                0
##   27.9                 0                0                0                0
##   28.6                 0                0                0                0
##   29.6                 0                0                0                0
##   29.8                 0                0                0                0
##   30.8                 0                0                0                0
##   31.6                 0                0                0                0
##   33.2                 0                0                0                0
##   33.3                 1                0                0                0
##   33.4                 0                0                0                0
##   34.7                 0                0                0                0
##   36                   0                0                0                0
##   36.2                 0                0                0                0
##   36.5                 0                0                0                0
##   37.3                 0                0                0                0
##   41.3                 0                0                0                0
##   43.1                 0                0                0                0
##   46                   0                1                0                0
##   50                   0                0                1                1
```

```r
library(MLmetrics)
print(1 - sum(diag(prop.table(tab))))

pred=predict(svmfit, newdata=Boston[test,])

mean_sqr_error_a <- MSE(pred, Boston[test, ]$medv)
print(mean_sqr_error_a)

mean_avg_error_a <- MAE(pred, Boston[test, ]$medv)
print(mean_avg_error_a)
```

We find that the MCR (missclassification rate) on test data is 0.92. The mean squared error is 42.86. The mean average error is 3.89.

SVR with Radial Basis Kernel

```r
set.seed(42)


cost <- c(0.001, 0.01, 0.1, 1, 10)
gamma <- c(0.001, 0.01, 0.1, 1.0, 10)
epsilon <- c(0.001, 0.01, 0.1, 1.0)

tune.out <- tune(svm, medv ~., data = Boston[train, ], kernel = "radial", ranges=list(cost=cost, gamma=g

perf <- tune.out$performance
perf$cost <- factor(perf$cost)
optimal_vals <- tune.out$best.parameters
print(optimal_vals)
```

```
##     cost gamma epsilon
## 65   10   0.1     0.1
```

```r
error <- tune.out$performances$error
#print(tune.out$performances$error)
```

```
ggplot(perf) + geom_line(aes(gamma, error ,group=cost, color=cost)) + scale_x_log10()
```
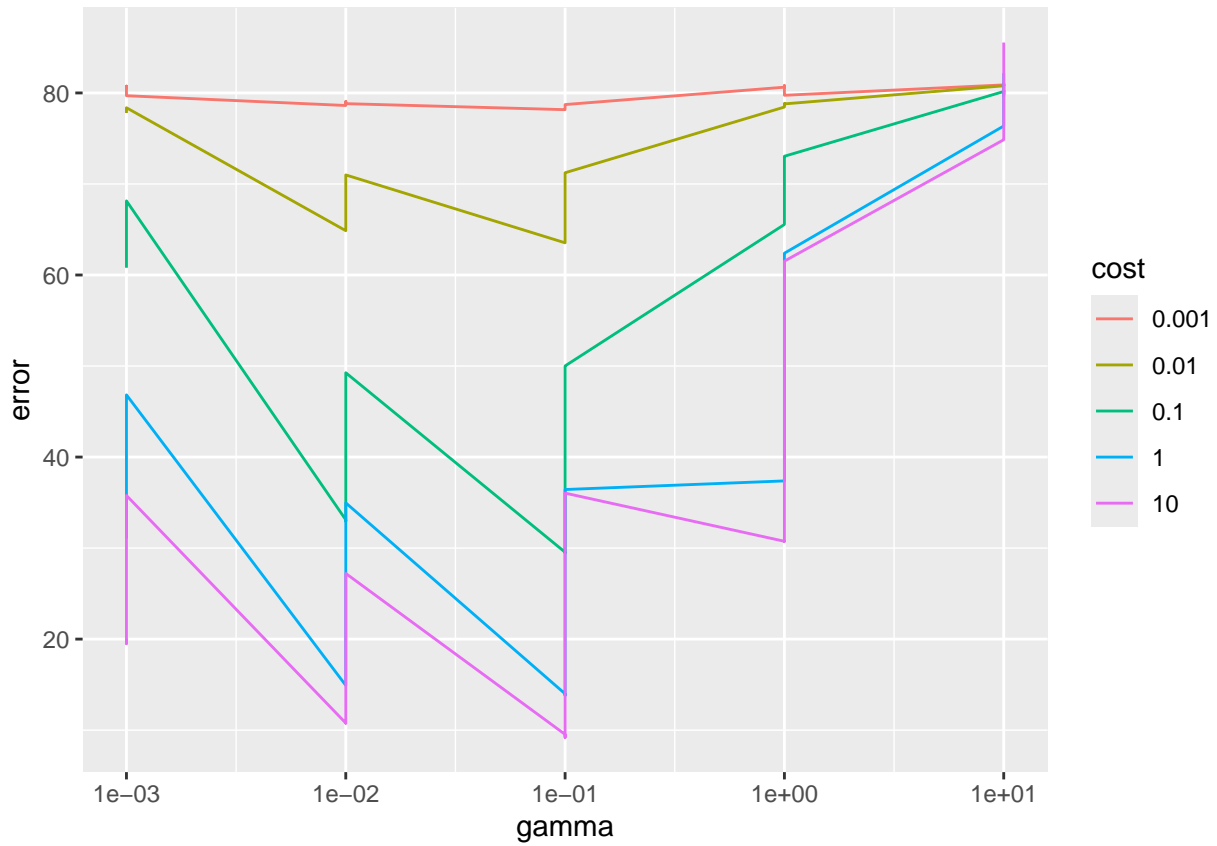


```
ggplot(perf) + geom_line(aes(epsilon, error ,group=cost, color=cost)) + scale_x_log10()
```
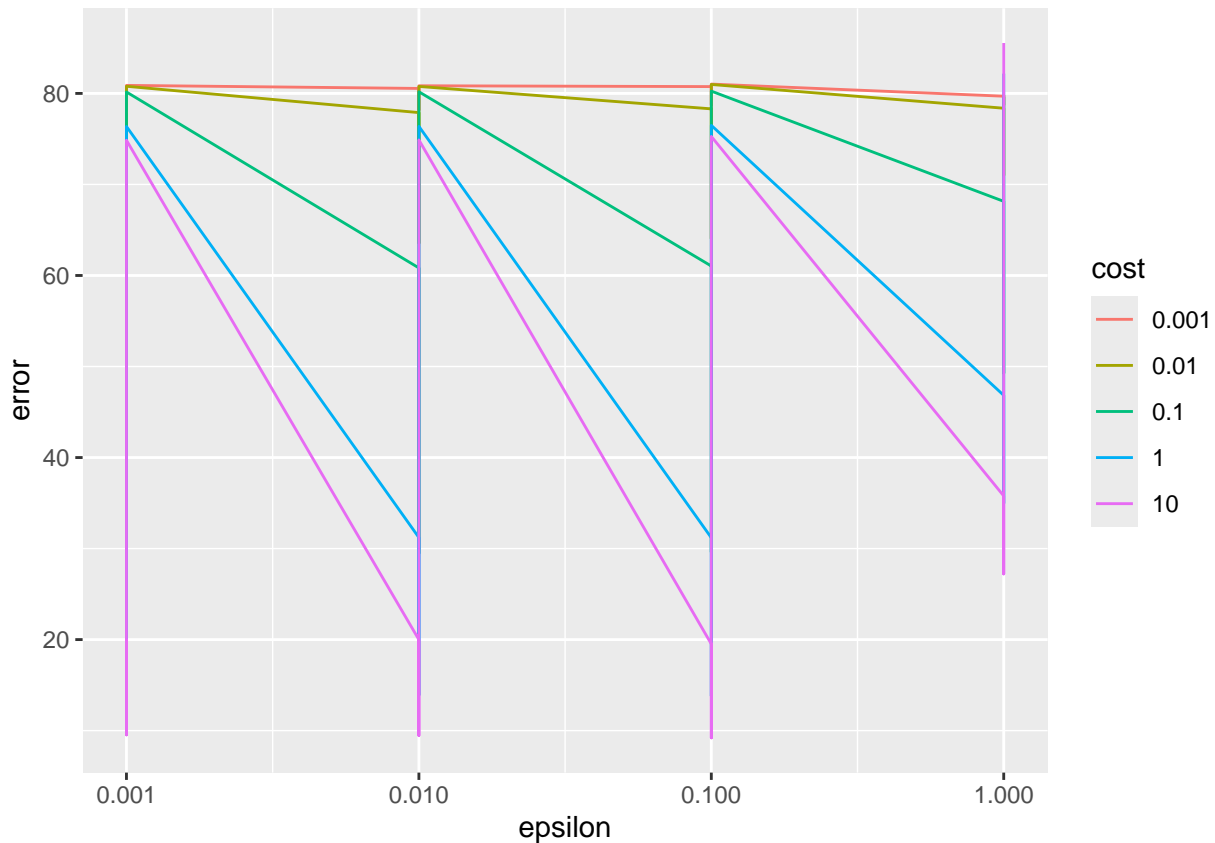
```
#ggplot(perf) + geom_line(aes(ep, error ,group=cost, color=cost)) + scale_x_log10()
```

The graph for gamma versus error has a nice convex shape. With fine-tuning the hyperparameters we find that the ideal hyper-parameters for radial svm is 10 for cost and 0.1 for gamma.

```
library(MLmetrics)
```

```
##
## Attaching package: 'MLmetrics'
```

```
## The following object is masked from 'package:base':
##
##     Recall
```

```
svmfit <- svm(medv ~., data = Boston[train,], kernel ="radial",
              gamma= tune.out$best.parameters$gamma,
              cost =tune.out$best.parameters$cost)
```

```
tab <- table(true = Boston[test, "medv"], pred=predict(svmfit, newdata=Boston[test,]))
print(tab)
```

```
##       pred
## true   7.09649208539967 7.56085236137221 8.26399070941445 8.58069099735715
##   5                   0                0                1                0
##   7                   0                0                0                0
##   7.2                 0                0                0                0
##   8.4                 0                0                0                1
##   8.5                 0                0                0                0
##   10.4                0                1                0                0
```

```
##   10.5                    1                    0                    0                    0
##   11.5                    0                    0                    0                    0
##   11.8                    0                    0                    0                    0
##   11.9                    0                    0                    0                    0
##   12                      0                    0                    0                    0
##   13.1                    0                    0                    0                    0
##   13.2                    0                    0                    0                    0
##   13.5                    0                    0                    0                    0
##   13.6                    0                    0                    0                    0
##   13.8                    0                    0                    0                    0
##   14.3                    0                    0                    0                    0
##   14.4                    0                    0                    0                    0
##   14.5                    0                    0                    0                    0
##   14.6                    0                    0                    0                    0
##   15.2                    0                    0                    0                    0
##   15.3                    0                    0                    0                    0
##   16.1                    0                    0                    0                    0
##   16.2                    0                    0                    0                    0
##   16.8                    0                    0                    0                    0
##   17.1                    0                    0                    0                    0
##   17.5                    0                    0                    0                    0
##   17.6                    0                    0                    0                    0
##   17.8                    0                    0                    0                    0
##   18.1                    0                    0                    0                    0
##   18.2                    0                    0                    0                    0
##   18.5                    0                    0                    0                    0
##   18.6                    0                    0                    0                    0
##   18.7                    0                    0                    0                    0
##   19.2                    0                    0                    0                    0
##   19.3                    0                    0                    0                    0
##   19.4                    0                    0                    0                    0
##   19.6                    0                    0                    0                    0
##   19.8                    0                    0                    0                    0
##   19.9                    0                    0                    0                    0
##   20                      0                    0                    0                    0
##   20.3                    0                    0                    0                    0
##   20.5                    0                    0                    0                    0
##   20.6                    0                    0                    0                    0
##   21.4                    0                    0                    0                    0
##   21.6                    0                    0                    0                    0
##   21.7                    0                    0                    0                    0
##   21.9                    0                    0                    0                    0
##   22.5                    0                    0                    0                    0
##   22.6                    0                    0                    0                    0
##   22.7                    0                    0                    0                    0
##   23                      0                    0                    0                    0
##   23.1                    0                    0                    0                    0
##   23.4                    0                    0                    0                    0
##   23.6                    0                    0                    0                    0
##   23.7                    0                    0                    0                    0
##   23.8                    0                    0                    0                    0
##   23.9                    0                    0                    0                    0
##   24.5                    0                    0                    0                    0
##   24.7                    0                    0                    0                    0
```

```
##    25                   0               0               0               0
##    26.4                 0               0               0               0
##    26.7                 0               0               0               0
##    27.1                 0               0               0               0
##    27.5                 0               0               0               0
##    27.9                 0               0               0               0
##    28.6                 0               0               0               0
##    29.6                 0               0               0               0
##    29.8                 0               0               0               0
##    30.8                 0               0               0               0
##    31.6                 0               0               0               0
##    33.2                 0               0               0               0
##    33.3                 0               0               0               0
##    33.4                 0               0               0               0
##    34.7                 0               0               0               0
##    36                   0               0               0               0
##    36.2                 0               0               0               0
##    36.5                 0               0               0               0
##    37.3                 0               0               0               0
##    41.3                 0               0               0               0
##    43.1                 0               0               0               0
##    46                   0               0               0               0
##    50                   0               0               0               0
##        pred
## true   9.28732895213308 9.95275358228568 10.1704136432245 11.4037789678227
##    5                    0               0               0               0
##    7                    0               0               1               0
##    7.2                  0               0               0               1
##    8.4                  0               0               0               0
##    8.5                  0               1               0               0
##    10.4                 0               0               0               0
##    10.5                 0               0               0               0
##    11.5                 0               0               0               0
##    11.8                 1               0               0               0
##    11.9                 0               0               0               0
##    12                   0               0               0               0
##    13.1                 0               0               0               0
##    13.2                 0               0               0               0
##    13.5                 0               0               0               0
##    13.6                 0               0               0               0
##    13.8                 0               0               0               0
##    14.3                 0               0               0               0
##    14.4                 0               0               0               0
##    14.5                 0               0               0               0
##    14.6                 0               0               0               0
##    15.2                 0               0               0               0
##    15.3                 0               0               0               0
##    16.1                 0               0               0               0
##    16.2                 0               0               0               0
##    16.8                 0               0               0               0
##    17.1                 0               0               0               0
##    17.5                 0               0               0               0
##    17.6                 0               0               0               0
##    17.8                 0               0               0               0
```

```
## 18.1            0            0            0            0
## 18.2            0            0            0            0
## 18.5            0            0            0            0
## 18.6            0            0            0            0
## 18.7            0            0            0            0
## 19.2            0            0            0            0
## 19.3            0            0            0            0
## 19.4            0            0            0            0
## 19.6            0            0            0            0
## 19.8            0            0            0            0
## 19.9            0            0            0            0
## 20              0            0            0            0
## 20.3            0            0            0            0
## 20.5            0            0            0            0
## 20.6            0            0            0            0
## 21.4            0            0            0            0
## 21.6            0            0            0            0
## 21.7            0            0            0            0
## 21.9            0            0            0            0
## 22.5            0            0            0            0
## 22.6            0            0            0            0
## 22.7            0            0            0            0
## 23              0            0            0            0
## 23.1            0            0            0            0
## 23.4            0            0            0            0
## 23.6            0            0            0            0
## 23.7            0            0            0            0
## 23.8            0            0            0            0
## 23.9            0            0            0            0
## 24.5            0            0            0            0
## 24.7            0            0            0            0
## 25              0            0            0            0
## 26.4            0            0            0            0
## 26.7            0            0            0            0
## 27.1            0            0            0            0
## 27.5            0            0            0            0
## 27.9            0            0            0            0
## 28.6            0            0            0            0
## 29.6            0            0            0            0
## 29.8            0            0            0            0
## 30.8            0            0            0            0
## 31.6            0            0            0            0
## 33.2            0            0            0            0
## 33.3            0            0            0            0
## 33.4            0            0            0            0
## 34.7            0            0            0            0
## 36              0            0            0            0
## 36.2            0            0            0            0
## 36.5            0            0            0            0
## 37.3            0            0            0            0
## 41.3            0            0            0            0
## 43.1            0            0            0            0
## 46              0            0            0            0
## 50              0            0            0            0
```

```
##         pred
## true   12.2160316680192 12.7184606232406 12.7764519542463 12.8042707660464
## 5                     0                0                0                0
## 7                     0                0                0                0
## 7.2                   0                0                0                0
## 8.4                   0                0                0                0
## 8.5                   0                0                0                0
## 10.4                  0                0                0                0
## 10.5                  0                0                0                0
## 11.5                  0                1                0                0
## 11.8                  0                0                0                0
## 11.9                  0                0                0                0
## 12                    0                0                0                0
## 13.1                  0                0                0                0
## 13.2                  0                0                1                0
## 13.5                  0                0                0                1
## 13.6                  0                0                0                0
## 13.8                  1                0                0                0
## 14.3                  0                0                0                0
## 14.4                  0                0                0                0
## 14.5                  0                0                0                0
## 14.6                  0                0                0                0
## 15.2                  0                0                0                0
## 15.3                  0                0                0                0
## 16.1                  0                0                0                0
## 16.2                  0                0                0                0
## 16.8                  0                0                0                0
## 17.1                  0                0                0                0
## 17.5                  0                0                0                0
## 17.6                  0                0                0                0
## 17.8                  0                0                0                0
## 18.1                  0                0                0                0
## 18.2                  0                0                0                0
## 18.5                  0                0                0                0
## 18.6                  0                0                0                0
## 18.7                  0                0                0                0
## 19.2                  0                0                0                0
## 19.3                  0                0                0                0
## 19.4                  0                0                0                0
## 19.6                  0                0                0                0
## 19.8                  0                0                0                0
## 19.9                  0                0                0                0
## 20                    0                0                0                0
## 20.3                  0                0                0                0
## 20.5                  0                0                0                0
## 20.6                  0                0                0                0
## 21.4                  0                0                0                0
## 21.6                  0                0                0                0
## 21.7                  0                0                0                0
## 21.9                  0                0                0                0
## 22.5                  0                0                0                0
## 22.6                  0                0                0                0
## 22.7                  0                0                0                0
## 23                    0                0                0                0
```

```
##   23.1             0              0              0              0
##   23.4             0              0              0              0
##   23.6             0              0              0              0
##   23.7             0              0              0              0
##   23.8             0              0              0              0
##   23.9             0              0              0              0
##   24.5             0              0              0              0
##   24.7             0              0              0              0
##   25               0              0              0              0
##   26.4             0              0              0              0
##   26.7             0              0              0              0
##   27.1             0              0              0              0
##   27.5             0              0              0              0
##   27.9             0              0              0              0
##   28.6             0              0              0              0
##   29.6             0              0              0              0
##   29.8             0              0              0              0
##   30.8             0              0              0              0
##   31.6             0              0              0              0
##   33.2             0              0              0              0
##   33.3             0              0              0              0
##   33.4             0              0              0              0
##   34.7             0              0              0              0
##   36               0              0              0              0
##   36.2             0              0              0              0
##   36.5             0              0              0              0
##   37.3             0              0              0              0
##   41.3             0              0              0              0
##   43.1             0              0              0              0
##   46               0              0              0              0
##   50               0              0              0              0
##        pred
## true   13.0369048516903 13.6780656569902 13.7855768555145 14.1327589992424
##   5                0              0              0              0
##   7                0              0              0              0
##   7.2              0              0              0              0
##   8.4              0              0              0              0
##   8.5              0              0              0              0
##   10.4             0              0              0              0
##   10.5             0              0              0              0
##   11.5             0              0              0              0
##   11.8             0              0              0              0
##   11.9             0              0              0              0
##   12               1              0              0              0
##   13.1             0              0              0              0
##   13.2             0              0              0              0
##   13.5             0              0              0              0
##   13.6             0              0              0              0
##   13.8             0              0              0              1
##   14.3             0              0              1              0
##   14.4             0              0              0              0
##   14.5             0              0              0              0
##   14.6             0              0              0              0
##   15.2             0              0              0              0
```

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```
## 15.3                0              0                0              0
## 16.1                0              0                0              0
## 16.2                0              0                0              0
## 16.8                0              0                0              0
## 17.1                0              0                0              0
## 17.5                0              0                0              0
## 17.6                0              0                0              0
## 17.8                0              1                0              0
## 18.1                0              0                0              0
## 18.2                0              0                0              0
## 18.5                0              0                0              0
## 18.6                0              0                0              0
## 18.7                0              0                0              0
## 19.2                0              0                0              0
## 19.3                0              0                0              0
## 19.4                0              0                0              0
## 19.6                0              0                0              0
## 19.8                0              0                0              0
## 19.9                0              0                0              0
## 20                  0              0                0              0
## 20.3                0              0                0              0
## 20.5                0              0                0              0
## 20.6                0              0                0              0
## 21.4                0              0                0              0
## 21.6                0              0                0              0
## 21.7                0              0                0              0
## 21.9                0              0                0              0
## 22.5                0              0                0              0
## 22.6                0              0                0              0
## 22.7                0              0                0              0
## 23                  0              0                0              0
## 23.1                0              0                0              0
## 23.4                0              0                0              0
## 23.6                0              0                0              0
## 23.7                0              0                0              0
## 23.8                0              0                0              0
## 23.9                0              0                0              0
## 24.5                0              0                0              0
## 24.7                0              0                0              0
## 25                  0              0                0              0
## 26.4                0              0                0              0
## 26.7                0              0                0              0
## 27.1                0              0                0              0
## 27.5                0              0                0              0
## 27.9                0              0                0              0
## 28.6                0              0                0              0
## 29.6                0              0                0              0
## 29.8                0              0                0              0
## 30.8                0              0                0              0
## 31.6                0              0                0              0
## 33.2                0              0                0              0
## 33.3                0              0                0              0
## 33.4                0              0                0              0
## 34.7                0              0                0              0
```

```
##   36                    0                0                0                0
##   36.2                  0                0                0                0
##   36.5                  0                0                0                0
##   37.3                  0                0                0                0
##   41.3                  0                0                0                0
##   43.1                  0                0                0                0
##   46                    0                0                0                0
##   50                    0                0                0                0
##        pred
## true   14.4289247313836 14.564796367722 14.7939101203036 15.2331737501465
##   5                     0                0                0                0
##   7                     0                0                0                0
##   7.2                   0                0                0                0
##   8.4                   0                0                0                0
##   8.5                   0                0                0                0
##   10.4                  0                0                0                0
##   10.5                  0                0                0                0
##   11.5                  0                0                0                0
##   11.8                  0                0                0                0
##   11.9                  0                0                0                0
##   12                    0                0                0                0
##   13.1                  0                0                0                0
##   13.2                  0                0                0                0
##   13.5                  0                0                0                0
##   13.6                  0                1                0                0
##   13.8                  0                0                0                0
##   14.3                  0                0                0                0
##   14.4                  0                0                0                0
##   14.5                  1                0                0                0
##   14.6                  0                0                1                0
##   15.2                  0                0                0                0
##   15.3                  0                0                0                1
##   16.1                  0                0                0                0
##   16.2                  0                0                0                0
##   16.8                  0                0                0                0
##   17.1                  0                0                0                0
##   17.5                  0                0                0                0
##   17.6                  0                0                0                0
##   17.8                  0                0                0                0
##   18.1                  0                0                0                0
##   18.2                  0                0                0                0
##   18.5                  0                0                0                0
##   18.6                  0                0                0                0
##   18.7                  0                0                0                0
##   19.2                  0                0                0                0
##   19.3                  0                0                0                0
##   19.4                  0                0                0                0
##   19.6                  0                0                0                0
##   19.8                  0                0                0                0
##   19.9                  0                0                0                0
##   20                    0                0                0                0
##   20.3                  0                0                0                0
##   20.5                  0                0                0                0
##   20.6                  0                0                0                0
```

```
## 21.4               0           0           0           0
## 21.6               0           0           0           0
## 21.7               0           0           0           0
## 21.9               0           0           0           0
## 22.5               0           0           0           0
## 22.6               0           0           0           0
## 22.7               0           0           0           0
## 23                 0           0           0           0
## 23.1               0           0           0           0
## 23.4               0           0           0           0
## 23.6               0           0           0           0
## 23.7               0           0           0           0
## 23.8               0           0           0           0
## 23.9               0           0           0           0
## 24.5               0           0           0           0
## 24.7               0           0           0           0
## 25                 0           0           0           0
## 26.4               0           0           0           0
## 26.7               0           0           0           0
## 27.1               0           0           0           0
## 27.5               0           0           0           0
## 27.9               0           0           0           0
## 28.6               0           0           0           0
## 29.6               0           0           0           0
## 29.8               0           0           0           0
## 30.8               0           0           0           0
## 31.6               0           0           0           0
## 33.2               0           0           0           0
## 33.3               0           0           0           0
## 33.4               0           0           0           0
## 34.7               0           0           0           0
## 36                 0           0           0           0
## 36.2               0           0           0           0
## 36.5               0           0           0           0
## 37.3               0           0           0           0
## 41.3               0           0           0           0
## 43.1               0           0           0           0
## 46                 0           0           0           0
## 50                 0           0           0           0
##       pred
## true   15.3952349058248 15.5357967031108 15.6246444719107 15.6622413344711
## 5                  0           0           1           0
## 7                  0           0           0           0
## 7.2                0           0           0           0
## 8.4                0           0           0           0
## 8.5                0           0           0           0
## 10.4               0           0           0           0
## 10.5               0           0           0           0
## 11.5               0           0           0           0
## 11.8               0           0           0           0
## 11.9               0           0           0           0
## 12                 0           0           0           0
## 13.1               1           0           0           0
## 13.2               0           0           0           0
```

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```
##   13.5            0             0             0             0
##   13.6            0             0             0             0
##   13.8            0             0             0             0
##   14.3            0             1             0             0
##   14.4            0             0             0             0
##   14.5            0             0             0             0
##   14.6            0             0             0             0
##   15.2            0             0             0             1
##   15.3            0             0             0             0
##   16.1            0             0             0             0
##   16.2            0             0             0             0
##   16.8            0             0             0             0
##   17.1            0             0             0             0
##   17.5            0             0             0             0
##   17.6            0             0             0             0
##   17.8            0             0             0             0
##   18.1            0             0             0             0
##   18.2            0             0             0             0
##   18.5            0             0             0             0
##   18.6            0             0             0             0
##   18.7            0             0             0             0
##   19.2            0             0             0             0
##   19.3            0             0             0             0
##   19.4            0             0             0             0
##   19.6            0             0             0             0
##   19.8            0             0             0             0
##   19.9            0             0             0             0
##   20              0             0             0             0
##   20.3            0             0             0             0
##   20.5            0             0             0             0
##   20.6            0             0             0             0
##   21.4            0             0             0             0
##   21.6            0             0             0             0
##   21.7            0             0             0             0
##   21.9            0             0             0             0
##   22.5            0             0             0             0
##   22.6            0             0             0             0
##   22.7            0             0             0             0
##   23              0             0             0             0
##   23.1            0             0             0             0
##   23.4            0             0             0             0
##   23.6            0             0             0             0
##   23.7            0             0             0             0
##   23.8            0             0             0             0
##   23.9            0             0             0             0
##   24.5            0             0             0             0
##   24.7            0             0             0             0
##   25              0             0             0             0
##   26.4            0             0             0             0
##   26.7            0             0             0             0
##   27.1            0             0             0             0
##   27.5            0             0             0             0
##   27.9            0             0             0             0
##   28.6            0             0             0             0
```

```
##    29.6              0              0              0              0
##    29.8              0              0              0              0
##    30.8              0              0              0              0
##    31.6              0              0              0              0
##    33.2              0              0              0              0
##    33.3              0              0              0              0
##    33.4              0              0              0              0
##    34.7              0              0              0              0
##    36                0              0              0              0
##    36.2              0              0              0              0
##    36.5              0              0              0              0
##    37.3              0              0              0              0
##    41.3              0              0              0              0
##    43.1              0              0              0              0
##    46                0              0              0              0
##    50                0              0              0              0
##        pred
## true   16.041333628136 16.0463840423167 16.2691117162333 17.1636473346718
##    5                0              0              0              0
##    7                0              0              0              0
##    7.2              0              0              0              0
##    8.4              0              0              0              0
##    8.5              0              0              0              0
##    10.4             0              0              0              0
##    10.5             0              0              0              0
##    11.5             0              0              0              0
##    11.8             0              0              0              0
##    11.9             0              0              0              0
##    12               0              0              0              0
##    13.1             0              0              0              0
##    13.2             0              0              0              0
##    13.5             0              0              0              0
##    13.6             0              0              0              0
##    13.8             0              0              0              0
##    14.3             0              0              0              0
##    14.4             0              0              1              0
##    14.5             0              0              0              0
##    14.6             0              0              0              0
##    15.2             0              0              0              0
##    15.3             0              0              0              0
##    16.1             0              0              0              0
##    16.2             1              0              0              0
##    16.8             0              0              0              0
##    17.1             0              0              0              0
##    17.5             0              0              0              0
##    17.6             0              0              0              0
##    17.8             0              0              0              1
##    18.1             0              0              0              0
##    18.2             0              0              0              0
##    18.5             0              0              0              0
##    18.6             0              0              0              0
##    18.7             0              0              0              0
##    19.2             0              0              0              0
##    19.3             0              0              0              0
```

```
##   19.4              0              0              0              0
##   19.6              0              0              0              0
##   19.8              0              0              0              0
##   19.9              0              0              0              0
##   20                0              0              0              0
##   20.3              0              0              0              0
##   20.5              0              0              0              0
##   20.6              0              0              0              0
##   21.4              0              0              0              0
##   21.6              0              0              0              0
##   21.7              0              0              0              0
##   21.9              0              0              0              0
##   22.5              0              0              0              0
##   22.6              0              0              0              0
##   22.7              0              0              0              0
##   23                0              0              0              0
##   23.1              0              0              0              0
##   23.4              0              0              0              0
##   23.6              0              0              0              0
##   23.7              0              0              0              0
##   23.8              0              0              0              0
##   23.9              0              0              0              0
##   24.5              0              0              0              0
##   24.7              0              0              0              0
##   25                0              0              0              0
##   26.4              0              0              0              0
##   26.7              0              0              0              0
##   27.1              0              0              0              0
##   27.5              0              1              0              0
##   27.9              0              0              0              0
##   28.6              0              0              0              0
##   29.6              0              0              0              0
##   29.8              0              0              0              0
##   30.8              0              0              0              0
##   31.6              0              0              0              0
##   33.2              0              0              0              0
##   33.3              0              0              0              0
##   33.4              0              0              0              0
##   34.7              0              0              0              0
##   36                0              0              0              0
##   36.2              0              0              0              0
##   36.5              0              0              0              0
##   37.3              0              0              0              0
##   41.3              0              0              0              0
##   43.1              0              0              0              0
##   46                0              0              0              0
##   50                0              0              0              0
##      pred
## true    17.4665114448696 17.523704446447 17.6969778505924 17.8255133509204
##   5                 0              0              0              0
##   7                 0              0              0              0
##   7.2               0              0              0              0
##   8.4               0              0              0              0
##   8.5               0              0              0              0
```

```
## 10.4                 0               0               0               0
## 10.5                 0               0               0               0
## 11.5                 0               0               0               0
## 11.8                 0               0               0               0
## 11.9                 0               0               0               0
## 12                   0               0               0               0
## 13.1                 0               0               0               0
## 13.2                 0               0               0               0
## 13.5                 0               0               0               0
## 13.6                 0               0               0               0
## 13.8                 0               0               0               0
## 14.3                 0               0               0               0
## 14.4                 0               0               0               0
## 14.5                 0               0               0               0
## 14.6                 0               0               0               0
## 15.2                 0               0               0               0
## 15.3                 0               0               0               0
## 16.1                 0               1               0               0
## 16.2                 0               0               0               0
## 16.8                 0               0               0               0
## 17.1                 0               0               0               0
## 17.5                 0               0               0               0
## 17.6                 0               0               0               0
## 17.8                 0               0               0               0
## 18.1                 0               0               0               0
## 18.2                 0               0               0               0
## 18.5                 0               0               0               0
## 18.6                 0               0               0               0
## 18.7                 0               0               1               0
## 19.2                 0               0               0               0
## 19.3                 0               0               0               0
## 19.4                 0               0               0               0
## 19.6                 0               0               0               0
## 19.8                 0               0               0               0
## 19.9                 0               0               0               0
## 20                   0               0               0               1
## 20.3                 0               0               0               0
## 20.5                 0               0               0               0
## 20.6                 0               0               0               0
## 21.4                 1               0               0               0
## 21.6                 0               0               0               0
## 21.7                 0               0               0               0
## 21.9                 0               0               0               0
## 22.5                 0               0               0               0
## 22.6                 0               0               0               0
## 22.7                 0               0               0               0
## 23                   0               0               0               0
## 23.1                 0               0               0               0
## 23.4                 0               0               0               0
## 23.6                 0               0               0               0
## 23.7                 0               0               0               0
## 23.8                 0               0               0               0
## 23.9                 0               0               0               0
## 24.5                 0               0               0               0
```

```
##   24.7                    0               0               0               0
##   25                      0               0               0               0
##   26.4                    0               0               0               0
##   26.7                    0               0               0               0
##   27.1                    0               0               0               0
##   27.5                    0               0               0               0
##   27.9                    0               0               0               0
##   28.6                    0               0               0               0
##   29.6                    0               0               0               0
##   29.8                    0               0               0               0
##   30.8                    0               0               0               0
##   31.6                    0               0               0               0
##   33.2                    0               0               0               0
##   33.3                    0               0               0               0
##   33.4                    0               0               0               0
##   34.7                    0               0               0               0
##   36                      0               0               0               0
##   36.2                    0               0               0               0
##   36.5                    0               0               0               0
##   37.3                    0               0               0               0
##   41.3                    0               0               0               0
##   43.1                    0               0               0               0
##   46                      0               0               0               0
##   50                      0               0               0               0
##       pred
## true   17.8387617442641 17.8431847621061 17.8815787652157 17.9319726052106
##   5                      0               0               0               0
##   7                      0               0               0               0
##   7.2                    0               0               0               0
##   8.4                    0               0               0               0
##   8.5                    0               0               0               0
##   10.4                   0               0               0               0
##   10.5                   0               0               0               0
##   11.5                   0               0               0               0
##   11.8                   0               0               0               0
##   11.9                   0               0               0               0
##   12                     0               0               0               0
##   13.1                   0               0               0               0
##   13.2                   0               0               0               0
##   13.5                   0               0               0               0
##   13.6                   0               0               0               0
##   13.8                   0               0               0               0
##   14.3                   0               0               0               0
##   14.4                   0               0               0               0
##   14.5                   0               0               0               0
##   14.6                   0               0               0               0
##   15.2                   0               0               0               0
##   15.3                   0               0               0               0
##   16.1                   0               0               0               0
##   16.2                   0               0               0               0
##   16.8                   0               0               0               0
##   17.1                   0               0               0               0
##   17.5                   0               0               0               0
##   17.6                   0               0               0               0
```

```
## 17.8           0            0            0            0
## 18.1           0            1            0            0
## 18.2           0            0            1            0
## 18.5           1            0            0            0
## 18.6           0            0            0            0
## 18.7           0            0            0            0
## 19.2           0            0            0            1
## 19.3           0            0            0            0
## 19.4           0            0            0            0
## 19.6           0            0            0            0
## 19.8           0            0            0            0
## 19.9           0            0            0            0
## 20             0            0            0            0
## 20.3           0            0            0            0
## 20.5           0            0            0            0
## 20.6           0            0            0            0
## 21.4           0            0            0            0
## 21.6           0            0            0            0
## 21.7           0            0            0            0
## 21.9           0            0            0            0
## 22.5           0            0            0            0
## 22.6           0            0            0            0
## 22.7           0            0            0            0
## 23             0            0            0            0
## 23.1           0            0            0            0
## 23.4           0            0            0            0
## 23.6           0            0            0            0
## 23.7           0            0            0            0
## 23.8           0            0            0            0
## 23.9           0            0            0            0
## 24.5           0            0            0            0
## 24.7           0            0            0            0
## 25             0            0            0            0
## 26.4           0            0            0            0
## 26.7           0            0            0            0
## 27.1           0            0            0            0
## 27.5           0            0            0            0
## 27.9           0            0            0            0
## 28.6           0            0            0            0
## 29.6           0            0            0            0
## 29.8           0            0            0            0
## 30.8           0            0            0            0
## 31.6           0            0            0            0
## 33.2           0            0            0            0
## 33.3           0            0            0            0
## 33.4           0            0            0            0
## 34.7           0            0            0            0
## 36             0            0            0            0
## 36.2           0            0            0            0
## 36.5           0            0            0            0
## 37.3           0            0            0            0
## 41.3           0            0            0            0
## 43.1           0            0            0            0
## 46             0            0            0            0
```

```
## 50                            0               0                0                 0
##        pred
## true   18.0846773458064 18.3880792774661 18.553673239627 18.6283967171148
## 5                              0               0                0                 0
## 7                              0               0                0                 0
## 7.2                            0               0                0                 0
## 8.4                            0               0                0                 0
## 8.5                            0               0                0                 0
## 10.4                           0               0                0                 0
## 10.5                           0               0                0                 0
## 11.5                           0               0                0                 0
## 11.8                           0               0                0                 0
## 11.9                           0               0                0                 0
## 12                             0               0                0                 0
## 13.1                           0               0                0                 0
## 13.2                           0               0                0                 0
## 13.5                           0               0                0                 0
## 13.6                           0               0                0                 0
## 13.8                           0               0                0                 0
## 14.3                           0               0                0                 0
## 14.4                           0               0                0                 0
## 14.5                           0               0                0                 0
## 14.6                           0               0                0                 0
## 15.2                           0               0                0                 0
## 15.3                           0               0                0                 0
## 16.1                           0               0                0                 0
## 16.2                           0               0                0                 0
## 16.8                           0               0                0                 0
## 17.1                           0               0                0                 0
## 17.5                           0               0                1                 0
## 17.6                           0               0                0                 1
## 17.8                           0               0                0                 0
## 18.1                           0               0                0                 0
## 18.2                           0               0                0                 0
## 18.5                           0               0                0                 0
## 18.6                           0               0                0                 0
## 18.7                           0               0                0                 0
## 19.2                           0               0                0                 0
## 19.3                           0               0                0                 0
## 19.4                           0               0                0                 0
## 19.6                           0               0                0                 0
## 19.8                           0               0                0                 0
## 19.9                           0               0                0                 0
## 20                             0               0                0                 0
## 20.3                           0               0                0                 0
## 20.5                           0               0                0                 0
## 20.6                           0               0                0                 0
## 21.4                           0               0                0                 0
## 21.6                           0               0                0                 0
## 21.7                           0               0                0                 0
## 21.9                           0               0                0                 0
## 22.5                           0               0                0                 0
## 22.6                           0               0                0                 0
## 22.7                           0               1                0                 0
```

```
##    23                      0              0              0               0
##    23.1                    0              0              0               0
##    23.4                    0              0              0               0
##    23.6                    0              0              0               0
##    23.7                    0              0              0               0
##    23.8                    0              0              0               0
##    23.9                    0              0              0               0
##    24.5                    0              0              0               0
##    24.7                    0              0              0               0
##    25                      0              0              0               0
##    26.4                    0              0              0               0
##    26.7                    0              0              0               0
##    27.1                    0              0              0               0
##    27.5                    0              0              0               0
##    27.9                    1              0              0               0
##    28.6                    0              0              0               0
##    29.6                    0              0              0               0
##    29.8                    0              0              0               0
##    30.8                    0              0              0               0
##    31.6                    0              0              0               0
##    33.2                    0              0              0               0
##    33.3                    0              0              0               0
##    33.4                    0              0              0               0
##    34.7                    0              0              0               0
##    36                      0              0              0               0
##    36.2                    0              0              0               0
##    36.5                    0              0              0               0
##    37.3                    0              0              0               0
##    41.3                    0              0              0               0
##    43.1                    0              0              0               0
##    46                      0              0              0               0
##    50                      0              0              0               0
##         pred
## true   18.6701781473293 18.967198895914 19.1214123212871 19.2664569016709
##    5                      0              0              0               0
##    7                      0              0              0               0
##    7.2                    0              0              0               0
##    8.4                    0              0              0               0
##    8.5                    0              0              0               0
##    10.4                   0              0              0               0
##    10.5                   0              0              0               0
##    11.5                   0              0              0               0
##    11.8                   0              0              0               0
##    11.9                   0              1              0               0
##    12                     0              0              0               0
##    13.1                   0              0              0               0
##    13.2                   0              0              0               0
##    13.5                   0              0              0               0
##    13.6                   0              0              0               0
##    13.8                   0              0              0               0
##    14.3                   0              0              0               0
##    14.4                   0              0              0               0
##    14.5                   0              0              0               0
##    14.6                   0              0              0               0
```

```
##   15.2                    0                 0                 0                 0
##   15.3                    0                 0                 0                 0
##   16.1                    0                 0                 0                 0
##   16.2                    0                 0                 0                 0
##   16.8                    0                 0                 0                 0
##   17.1                    0                 0                 0                 0
##   17.5                    0                 0                 0                 0
##   17.6                    0                 0                 0                 0
##   17.8                    0                 0                 0                 0
##   18.1                    0                 0                 0                 0
##   18.2                    0                 0                 0                 1
##   18.5                    0                 0                 0                 0
##   18.6                    0                 0                 0                 0
##   18.7                    0                 0                 0                 0
##   19.2                    0                 0                 0                 0
##   19.3                    1                 0                 0                 0
##   19.4                    0                 0                 0                 0
##   19.6                    0                 0                 0                 0
##   19.8                    0                 0                 0                 0
##   19.9                    0                 0                 1                 0
##   20                      0                 0                 0                 0
##   20.3                    0                 0                 0                 0
##   20.5                    0                 0                 0                 0
##   20.6                    0                 0                 0                 0
##   21.4                    0                 0                 0                 0
##   21.6                    0                 0                 0                 0
##   21.7                    0                 0                 0                 0
##   21.9                    0                 0                 0                 0
##   22.5                    0                 0                 0                 0
##   22.6                    0                 0                 0                 0
##   22.7                    0                 0                 0                 0
##   23                      0                 0                 0                 0
##   23.1                    0                 0                 0                 0
##   23.4                    0                 0                 0                 0
##   23.6                    0                 0                 0                 0
##   23.7                    0                 0                 0                 0
##   23.8                    0                 0                 0                 0
##   23.9                    0                 0                 0                 0
##   24.5                    0                 0                 0                 0
##   24.7                    0                 0                 0                 0
##   25                      0                 0                 0                 0
##   26.4                    0                 0                 0                 0
##   26.7                    0                 0                 0                 0
##   27.1                    0                 0                 0                 0
##   27.5                    0                 0                 0                 0
##   27.9                    0                 0                 0                 0
##   28.6                    0                 0                 0                 0
##   29.6                    0                 0                 0                 0
##   29.8                    0                 0                 0                 0
##   30.8                    0                 0                 0                 0
##   31.6                    0                 0                 0                 0
##   33.2                    0                 0                 0                 0
##   33.3                    0                 0                 0                 0
##   33.4                    0                 0                 0                 0
```

```
##    34.7                   0               0               0               0
##    36                     0               0               0               0
##    36.2                   0               0               0               0
##    36.5                   0               0               0               0
##    37.3                   0               0               0               0
##    41.3                   0               0               0               0
##    43.1                   0               0               0               0
##    46                     0               0               0               0
##    50                     0               0               0               0
##        pred
## true   19.3026920935943 19.4107381565528 19.4470230109526 19.5036366469264
##    5                    0                0                0                0
##    7                    0                0                0                0
##    7.2                  0                0                0                0
##    8.4                  0                0                0                0
##    8.5                  0                0                0                0
##    10.4                 0                0                0                0
##    10.5                 0                0                0                0
##    11.5                 0                0                0                0
##    11.8                 0                0                0                0
##    11.9                 0                0                0                0
##    12                   0                0                0                0
##    13.1                 0                0                0                0
##    13.2                 0                0                0                0
##    13.5                 0                0                0                0
##    13.6                 0                0                0                0
##    13.8                 0                0                0                0
##    14.3                 0                0                0                0
##    14.4                 0                0                0                0
##    14.5                 0                0                0                0
##    14.6                 0                0                0                0
##    15.2                 0                0                0                0
##    15.3                 0                0                0                0
##    16.1                 0                0                0                0
##    16.2                 0                0                0                0
##    16.8                 0                1                0                0
##    17.1                 0                0                1                0
##    17.5                 0                0                0                0
##    17.6                 0                0                0                0
##    17.8                 0                0                0                0
##    18.1                 0                0                0                0
##    18.2                 0                0                0                0
##    18.5                 0                0                0                0
##    18.6                 0                0                0                0
##    18.7                 0                0                0                0
##    19.2                 0                0                0                0
##    19.3                 0                0                0                0
##    19.4                 0                0                0                1
##    19.6                 0                0                0                0
##    19.8                 0                0                0                0
##    19.9                 0                0                0                0
##    20                   0                0                0                0
##    20.3                 0                0                0                0
##    20.5                 0                0                0                0
```

```
##   20.6                0                0                0                0
##   21.4                0                0                0                0
##   21.6                0                0                0                0
##   21.7                0                0                0                0
##   21.9                0                0                0                0
##   22.5                0                0                0                0
##   22.6                0                0                0                0
##   22.7                0                0                0                0
##   23                  0                0                0                0
##   23.1                0                0                0                0
##   23.4                0                0                0                0
##   23.6                0                0                0                0
##   23.7                0                0                0                0
##   23.8                0                0                0                0
##   23.9                0                0                0                0
##   24.5                0                0                0                0
##   24.7                0                0                0                0
##   25                  0                0                0                0
##   26.4                0                0                0                0
##   26.7                0                0                0                0
##   27.1                0                0                0                0
##   27.5                0                0                0                0
##   27.9                0                0                0                0
##   28.6                0                0                0                0
##   29.6                0                0                0                0
##   29.8                0                0                0                0
##   30.8                0                0                0                0
##   31.6                0                0                0                0
##   33.2                0                0                0                0
##   33.3                0                0                0                0
##   33.4                0                0                0                0
##   34.7                0                0                0                0
##   36                  0                0                0                0
##   36.2                0                0                0                0
##   36.5                0                0                0                0
##   37.3                0                0                0                0
##   41.3                0                0                0                0
##   43.1                0                0                0                0
##   46                  0                0                0                0
##   50                  1                0                0                0
##        pred
## true   19.7902437019772 19.8058977229365 19.9246697622746 20.1546826717785
##   5                    0                0                0                0
##   7                    0                0                0                0
##   7.2                  0                0                0                0
##   8.4                  0                0                0                0
##   8.5                  0                0                0                0
##   10.4                 0                0                0                0
##   10.5                 0                0                0                0
##   11.5                 0                0                0                0
##   11.8                 0                0                0                0
##   11.9                 0                0                0                0
##   12                   0                0                0                0
##   13.1                 0                0                0                0
```

```
## 13.2              0            0            0            0
## 13.5              0            0            0            0
## 13.6              0            0            0            0
## 13.8              0            0            1            0
## 14.3              0            0            0            0
## 14.4              0            0            0            0
## 14.5              0            0            0            0
## 14.6              0            0            0            0
## 15.2              0            0            0            0
## 15.3              0            0            0            0
## 16.1              0            0            0            0
## 16.2              0            0            0            0
## 16.8              0            0            0            0
## 17.1              0            0            0            0
## 17.5              0            0            0            0
## 17.6              0            0            0            0
## 17.8              0            0            0            0
## 18.1              0            0            0            0
## 18.2              0            0            0            0
## 18.5              0            0            0            0
## 18.6              0            0            0            0
## 18.7              0            0            0            0
## 19.2              0            0            0            0
## 19.3              0            0            0            0
## 19.4              0            0            0            0
## 19.6              0            0            0            0
## 19.8              0            0            0            0
## 19.9              0            0            0            0
## 20                0            0            0            0
## 20.3              0            0            0            0
## 20.5              0            0            0            0
## 20.6              1            0            0            0
## 21.4              0            0            0            0
## 21.6              0            0            0            0
## 21.7              0            0            0            1
## 21.9              0            1            0            0
## 22.5              0            0            0            0
## 22.6              0            0            0            0
## 22.7              0            0            0            0
## 23                0            0            0            0
## 23.1              0            0            0            0
## 23.4              0            0            0            0
## 23.6              0            0            0            0
## 23.7              0            0            0            0
## 23.8              0            0            0            0
## 23.9              0            0            0            0
## 24.5              0            0            0            0
## 24.7              0            0            0            0
## 25                0            0            0            0
## 26.4              0            0            0            0
## 26.7              0            0            0            0
## 27.1              0            0            0            0
## 27.5              0            0            0            0
## 27.9              0            0            0            0
```

```
##    28.6                  0              0              0              0
##    29.6                  0              0              0              0
##    29.8                  0              0              0              0
##    30.8                  0              0              0              0
##    31.6                  0              0              0              0
##    33.2                  0              0              0              0
##    33.3                  0              0              0              0
##    33.4                  0              0              0              0
##    34.7                  0              0              0              0
##    36                    0              0              0              0
##    36.2                  0              0              0              0
##    36.5                  0              0              0              0
##    37.3                  0              0              0              0
##    41.3                  0              0              0              0
##    43.1                  0              0              0              0
##    46                    0              0              0              0
##    50                    0              0              0              0
##         pred
## true    20.5051764513493 20.6577449678217 20.6631860204387 20.7123072719266
##    5                    0              0              0              0
##    7                    0              0              0              0
##    7.2                  0              0              0              0
##    8.4                  0              0              0              0
##    8.5                  0              0              0              0
##    10.4                 0              0              0              0
##    10.5                 0              0              0              0
##    11.5                 0              0              0              0
##    11.8                 0              0              0              0
##    11.9                 0              0              0              0
##    12                   0              0              0              0
##    13.1                 0              0              0              0
##    13.2                 0              0              0              0
##    13.5                 0              0              0              0
##    13.6                 0              0              0              0
##    13.8                 0              0              0              0
##    14.3                 0              0              0              0
##    14.4                 0              0              0              0
##    14.5                 0              0              0              0
##    14.6                 0              0              0              0
##    15.2                 0              0              0              0
##    15.3                 0              0              0              0
##    16.1                 0              0              0              0
##    16.2                 0              0              0              0
##    16.8                 0              0              0              0
##    17.1                 0              0              0              0
##    17.5                 0              0              0              0
##    17.6                 0              0              0              0
##    17.8                 0              0              0              0
##    18.1                 0              0              0              0
##    18.2                 0              0              0              0
##    18.5                 0              0              0              0
##    18.6                 0              0              0              0
##    18.7                 0              0              0              0
##    19.2                 0              0              0              0
```

```
##    19.3                    0               0               1               0
##    19.4                    0               0               0               0
##    19.6                    0               0               0               0
##    19.8                    0               0               0               1
##    19.9                    0               0               0               0
##    20                      0               0               0               0
##    20.3                    0               0               0               0
##    20.5                    0               1               0               0
##    20.6                    0               0               0               0
##    21.4                    0               0               0               0
##    21.6                    1               0               0               0
##    21.7                    0               0               0               0
##    21.9                    0               0               0               0
##    22.5                    0               0               0               0
##    22.6                    0               0               0               0
##    22.7                    0               0               0               0
##    23                      0               0               0               0
##    23.1                    0               0               0               0
##    23.4                    0               0               0               0
##    23.6                    0               0               0               0
##    23.7                    0               0               0               0
##    23.8                    0               0               0               0
##    23.9                    0               0               0               0
##    24.5                    0               0               0               0
##    24.7                    0               0               0               0
##    25                      0               0               0               0
##    26.4                    0               0               0               0
##    26.7                    0               0               0               0
##    27.1                    0               0               0               0
##    27.5                    0               0               0               0
##    27.9                    0               0               0               0
##    28.6                    0               0               0               0
##    29.6                    0               0               0               0
##    29.8                    0               0               0               0
##    30.8                    0               0               0               0
##    31.6                    0               0               0               0
##    33.2                    0               0               0               0
##    33.3                    0               0               0               0
##    33.4                    0               0               0               0
##    34.7                    0               0               0               0
##    36                      0               0               0               0
##    36.2                    0               0               0               0
##    36.5                    0               0               0               0
##    37.3                    0               0               0               0
##    41.3                    0               0               0               0
##    43.1                    0               0               0               0
##    46                      0               0               0               0
##    50                      0               0               0               0
##         pred
## true   20.795633620736 21.2991360479821 21.4936502003207 21.7921411644268
##    5                  0                0                0                0
##    7                  0                0                0                0
##    7.2                0                0                0                0
##    8.4                0                0                0                0
```

```
##   8.5               0              0              0              0
##   10.4              0              0              0              0
##   10.5              0              0              0              0
##   11.5              0              0              0              0
##   11.8              0              0              0              0
##   11.9              0              0              0              0
##   12                0              0              0              0
##   13.1              0              0              0              0
##   13.2              0              0              0              0
##   13.5              0              0              0              0
##   13.6              0              0              0              0
##   13.8              0              0              0              0
##   14.3              0              0              0              0
##   14.4              0              0              0              0
##   14.5              0              0              0              0
##   14.6              0              0              0              0
##   15.2              0              0              0              0
##   15.3              0              0              0              0
##   16.1              0              0              0              0
##   16.2              0              0              0              0
##   16.8              0              0              0              0
##   17.1              0              0              0              0
##   17.5              0              0              0              0
##   17.6              0              0              0              0
##   17.8              0              0              0              0
##   18.1              0              0              0              0
##   18.2              0              0              0              0
##   18.5              0              0              0              0
##   18.6              0              0              0              0
##   18.7              0              0              0              0
##   19.2              0              0              0              0
##   19.3              0              0              0              0
##   19.4              0              0              0              0
##   19.6              0              0              0              0
##   19.8              0              0              0              0
##   19.9              0              0              0              0
##   20                0              0              0              0
##   20.3              1              0              0              1
##   20.5              0              0              0              0
##   20.6              0              0              1              0
##   21.4              0              0              0              0
##   21.6              0              0              0              0
##   21.7              0              0              0              0
##   21.9              0              0              0              0
##   22.5              0              0              0              0
##   22.6              0              1              0              0
##   22.7              0              0              0              0
##   23                0              0              0              0
##   23.1              0              0              0              0
##   23.4              0              0              0              0
##   23.6              0              0              0              0
##   23.7              0              0              0              0
##   23.8              0              0              0              0
##   23.9              0              0              0              0
```

```
##   24.5              0              0              0              0
##   24.7              0              0              0              0
##   25                0              0              0              0
##   26.4              0              0              0              0
##   26.7              0              0              0              0
##   27.1              0              0              0              0
##   27.5              0              0              0              0
##   27.9              0              0              0              0
##   28.6              0              0              0              0
##   29.6              0              0              0              0
##   29.8              0              0              0              0
##   30.8              0              0              0              0
##   31.6              0              0              0              0
##   33.2              0              0              0              0
##   33.3              0              0              0              0
##   33.4              0              0              0              0
##   34.7              0              0              0              0
##   36                0              0              0              0
##   36.2              0              0              0              0
##   36.5              0              0              0              0
##   37.3              0              0              0              0
##   41.3              0              0              0              0
##   43.1              0              0              0              0
##   46                0              0              0              0
##   50                0              0              0              0
##        pred
## true   21.9190793716425 22.1722340980909 22.2292303594208 22.3528854926178
##   5                 0              0              0              0
##   7                 0              0              0              0
##   7.2               0              0              0              0
##   8.4               0              0              0              0
##   8.5               0              0              0              0
##   10.4              0              0              0              0
##   10.5              0              0              0              0
##   11.5              0              0              0              0
##   11.8              0              0              0              0
##   11.9              0              0              0              0
##   12                0              0              0              0
##   13.1              0              0              0              0
##   13.2              0              0              0              0
##   13.5              0              0              0              0
##   13.6              0              0              0              0
##   13.8              0              0              0              0
##   14.3              0              0              0              0
##   14.4              0              0              0              0
##   14.5              0              0              0              0
##   14.6              0              0              0              0
##   15.2              0              0              0              0
##   15.3              0              0              0              0
##   16.1              0              0              0              0
##   16.2              0              0              0              0
##   16.8              0              0              0              0
##   17.1              0              0              0              0
##   17.5              0              0              0              0
```

```
##   17.6              0              0              0              0
##   17.8              0              0              0              0
##   18.1              0              0              0              0
##   18.2              0              0              0              0
##   18.5              0              0              0              0
##   18.6              0              0              0              0
##   18.7              0              0              0              0
##   19.2              0              0              0              0
##   19.3              0              0              0              0
##   19.4              0              0              0              0
##   19.6              0              0              1              0
##   19.8              0              0              0              0
##   19.9              0              0              0              0
##   20                0              0              0              0
##   20.3              0              0              0              0
##   20.5              0              0              0              0
##   20.6              0              0              0              0
##   21.4              0              0              0              1
##   21.6              0              0              0              0
##   21.7              0              0              0              0
##   21.9              0              0              0              0
##   22.5              0              0              0              0
##   22.6              0              0              0              0
##   22.7              0              0              0              0
##   23                0              0              0              0
##   23.1              0              0              0              0
##   23.4              0              0              0              0
##   23.6              0              0              0              0
##   23.7              1              0              0              0
##   23.8              0              0              0              0
##   23.9              0              1              0              0
##   24.5              0              0              0              0
##   24.7              0              0              0              0
##   25                0              0              0              0
##   26.4              0              0              0              0
##   26.7              0              0              0              0
##   27.1              0              0              0              0
##   27.5              0              0              0              0
##   27.9              0              0              0              0
##   28.6              0              0              0              0
##   29.6              0              0              0              0
##   29.8              0              0              0              0
##   30.8              0              0              0              0
##   31.6              0              0              0              0
##   33.2              0              0              0              0
##   33.3              0              0              0              0
##   33.4              0              0              0              0
##   34.7              0              0              0              0
##   36                0              0              0              0
##   36.2              0              0              0              0
##   36.5              0              0              0              0
##   37.3              0              0              0              0
##   41.3              0              0              0              0
##   43.1              0              0              0              0
```

```
##   46                 0               0               0               0
##   50                 0               0               0               0
##       pred
## true   22.368654231284 22.5662676914778 22.6273453748541 22.8486368234441
##   5                  0               0               0               0
##   7                  0               0               0               0
##   7.2                0               0               0               0
##   8.4                0               0               0               0
##   8.5                0               0               0               0
##   10.4               0               0               0               0
##   10.5               0               0               0               0
##   11.5               0               0               0               0
##   11.8               0               0               0               0
##   11.9               0               0               0               0
##   12                 0               0               0               0
##   13.1               0               0               0               0
##   13.2               0               0               0               0
##   13.5               0               0               0               0
##   13.6               0               0               0               0
##   13.8               0               0               0               0
##   14.3               0               0               0               0
##   14.4               0               0               0               0
##   14.5               0               0               0               0
##   14.6               0               0               0               0
##   15.2               0               0               0               0
##   15.3               0               0               0               0
##   16.1               0               0               0               0
##   16.2               0               0               0               0
##   16.8               0               0               0               0
##   17.1               0               0               0               0
##   17.5               0               0               0               0
##   17.6               0               0               0               0
##   17.8               0               0               0               0
##   18.1               0               0               0               0
##   18.2               0               0               0               0
##   18.5               0               0               0               0
##   18.6               1               0               0               0
##   18.7               0               0               0               0
##   19.2               0               0               0               0
##   19.3               0               0               0               0
##   19.4               0               0               0               0
##   19.6               0               0               0               0
##   19.8               0               0               0               0
##   19.9               0               0               0               0
##   20                 0               0               0               0
##   20.3               0               0               0               0
##   20.5               0               0               0               0
##   20.6               0               0               0               1
##   21.4               0               0               0               0
##   21.6               0               0               0               0
##   21.7               0               0               0               0
##   21.9               0               0               0               0
##   22.5               0               0               1               0
##   22.6               0               0               0               0
```

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```
## 22.7              0              0                0                0
## 23               0              0                0                0
## 23.1             0              0                0                0
## 23.4             0              0                0                0
## 23.6             0              0                0                0
## 23.7             0              0                0                0
## 23.8             0              0                0                0
## 23.9             0              0                0                0
## 24.5             0              0                0                0
## 24.7             0              1                0                0
## 25               0              0                0                0
## 26.4             0              0                0                0
## 26.7             0              0                0                0
## 27.1             0              0                0                0
## 27.5             0              0                0                0
## 27.9             0              0                0                0
## 28.6             0              0                0                0
## 29.6             0              0                0                0
## 29.8             0              0                0                0
## 30.8             0              0                0                0
## 31.6             0              0                0                0
## 33.2             0              0                0                0
## 33.3             0              0                0                0
## 33.4             0              0                0                0
## 34.7             0              0                0                0
## 36               0              0                0                0
## 36.2             0              0                0                0
## 36.5             0              0                0                0
## 37.3             0              0                0                0
## 41.3             0              0                0                0
## 43.1             0              0                0                0
## 46               0              0                0                0
## 50               0              0                0                0
##        pred
## true   23.018378506136 23.1583967450569 23.7518425013634 23.7743471417662
## 5                 0              0                0                0
## 7                 0              0                0                0
## 7.2               0              0                0                0
## 8.4               0              0                0                0
## 8.5               0              0                0                0
## 10.4              0              0                0                0
## 10.5              0              0                0                0
## 11.5              0              0                0                0
## 11.8              0              0                0                0
## 11.9              0              0                0                0
## 12                0              0                0                0
## 13.1              0              0                0                0
## 13.2              0              0                0                0
## 13.5              0              0                0                0
## 13.6              0              0                0                0
## 13.8              0              0                0                0
## 14.3              0              0                0                0
## 14.4              0              0                0                0
## 14.5              0              0                0                0
```

```
## 14.6              0              0              0              0
## 15.2              0              0              0              0
## 15.3              0              0              0              0
## 16.1              0              0              0              0
## 16.2              0              0              0              0
## 16.8              0              0              0              0
## 17.1              0              0              0              0
## 17.5              0              0              0              0
## 17.6              0              0              0              0
## 17.8              0              0              0              0
## 18.1              0              0              0              0
## 18.2              0              0              0              0
## 18.5              0              0              0              0
## 18.6              0              0              0              0
## 18.7              0              0              0              0
## 19.2              0              0              0              0
## 19.3              0              0              0              0
## 19.4              0              0              0              0
## 19.6              0              0              0              0
## 19.8              0              0              0              0
## 19.9              0              0              0              0
## 20               0              0              0              0
## 20.3              0              0              0              0
## 20.5              0              0              0              0
## 20.6              0              0              0              0
## 21.4              0              0              0              0
## 21.6              0              0              0              0
## 21.7              0              0              0              0
## 21.9              0              0              0              0
## 22.5              0              0              0              0
## 22.6              0              0              0              0
## 22.7              0              0              0              0
## 23               0              1              0              1
## 23.1              0              0              0              0
## 23.4              0              0              0              0
## 23.6              0              0              0              0
## 23.7              0              0              0              0
## 23.8              0              0              1              0
## 23.9              0              0              0              0
## 24.5              0              0              0              0
## 24.7              0              0              0              0
## 25               0              0              0              0
## 26.4              0              0              0              0
## 26.7              0              0              0              0
## 27.1              0              0              0              0
## 27.5              0              0              0              0
## 27.9              0              0              0              0
## 28.6              0              0              0              0
## 29.6              0              0              0              0
## 29.8              1              0              0              0
## 30.8              0              0              0              0
## 31.6              0              0              0              0
## 33.2              0              0              0              0
## 33.3              0              0              0              0
```

```
##   33.4              0              0              0              0
##   34.7              0              0              0              0
##   36                0              0              0              0
##   36.2              0              0              0              0
##   36.5              0              0              0              0
##   37.3              0              0              0              0
##   41.3              0              0              0              0
##   43.1              0              0              0              0
##   46                0              0              0              0
##   50                0              0              0              0
##         pred
## true   24.1818031034244 24.3015135014542 24.3593511800499 24.5510987380629
##   5                  0                0                0                0
##   7                  0                0                0                0
##   7.2                0                0                0                0
##   8.4                0                0                0                0
##   8.5                0                0                0                0
##   10.4               0                0                0                0
##   10.5               0                0                0                0
##   11.5               0                0                0                0
##   11.8               0                0                0                0
##   11.9               0                0                0                0
##   12                 0                0                0                0
##   13.1               0                0                0                0
##   13.2               0                0                0                0
##   13.5               0                0                0                0
##   13.6               0                0                0                0
##   13.8               0                0                0                0
##   14.3               0                0                0                0
##   14.4               0                0                0                0
##   14.5               0                0                0                0
##   14.6               0                0                0                0
##   15.2               0                0                0                0
##   15.3               0                0                0                0
##   16.1               0                0                0                0
##   16.2               0                0                0                0
##   16.8               0                0                0                0
##   17.1               0                0                0                0
##   17.5               0                0                0                0
##   17.6               0                0                0                0
##   17.8               0                0                0                0
##   18.1               0                0                0                0
##   18.2               0                0                0                0
##   18.5               0                0                0                0
##   18.6               0                0                0                0
##   18.7               0                0                0                0
##   19.2               0                0                0                0
##   19.3               0                0                0                0
##   19.4               0                0                0                0
##   19.6               0                0                0                0
##   19.8               0                0                0                0
##   19.9               0                0                0                0
##   20                 0                0                0                0
##   20.3               0                0                0                0
```

```
##   20.5              0              0              0              0
##   20.6              0              0              0              0
##   21.4              0              0              0              0
##   21.6              0              0              0              0
##   21.7              0              0              0              0
##   21.9              0              0              0              0
##   22.5              0              0              0              0
##   22.6              0              0              0              0
##   22.7              0              0              0              0
##   23                0              0              0              0
##   23.1              0              0              1              0
##   23.4              0              1              0              0
##   23.6              0              0              0              0
##   23.7              0              0              0              0
##   23.8              0              0              0              0
##   23.9              0              0              0              0
##   24.5              1              0              0              0
##   24.7              0              0              0              0
##   25                0              0              0              1
##   26.4              0              0              0              0
##   26.7              0              0              0              0
##   27.1              0              0              0              0
##   27.5              0              0              0              0
##   27.9              0              0              0              0
##   28.6              0              0              0              0
##   29.6              0              0              0              0
##   29.8              0              0              0              0
##   30.8              0              0              0              0
##   31.6              0              0              0              0
##   33.2              0              0              0              0
##   33.3              0              0              0              0
##   33.4              0              0              0              0
##   34.7              0              0              0              0
##   36                0              0              0              0
##   36.2              0              0              0              0
##   36.5              0              0              0              0
##   37.3              0              0              0              0
##   41.3              0              0              0              0
##   43.1              0              0              0              0
##   46                0              0              0              0
##   50                0              0              0              0
##       pred
## true   24.5731210199955 25.5732369338361 26.1990984967165 26.2857088629334
##   5                0              0              0              0
##   7                0              0              0              0
##   7.2              0              0              0              0
##   8.4              0              0              0              0
##   8.5              0              0              0              0
##   10.4             0              0              0              0
##   10.5             0              0              0              0
##   11.5             0              0              0              0
##   11.8             0              0              0              0
##   11.9             0              0              0              0
##   12               0              0              0              0
```

```
##   13.1              0              0              0              0
##   13.2              0              0              0              0
##   13.5              0              0              0              0
##   13.6              0              0              0              0
##   13.8              0              0              0              0
##   14.3              0              0              0              0
##   14.4              0              0              0              0
##   14.5              0              0              0              0
##   14.6              0              0              0              0
##   15.2              0              0              0              0
##   15.3              0              0              0              0
##   16.1              0              0              0              0
##   16.2              0              0              0              0
##   16.8              0              0              0              0
##   17.1              0              0              0              0
##   17.5              0              0              0              0
##   17.6              0              0              0              0
##   17.8              0              0              0              0
##   18.1              0              0              0              0
##   18.2              0              0              0              0
##   18.5              0              0              0              0
##   18.6              0              0              0              0
##   18.7              0              0              0              0
##   19.2              0              0              0              0
##   19.3              0              0              0              0
##   19.4              0              0              0              0
##   19.6              0              0              0              0
##   19.8              0              0              0              0
##   19.9              0              0              0              0
##   20                0              0              0              0
##   20.3              0              0              0              0
##   20.5              0              0              0              0
##   20.6              0              0              0              0
##   21.4              0              0              0              0
##   21.6              0              0              0              0
##   21.7              0              0              0              0
##   21.9              0              0              0              0
##   22.5              0              0              0              0
##   22.6              0              0              0              0
##   22.7              0              0              0              0
##   23                0              1              0              0
##   23.1              0              0              0              0
##   23.4              0              0              0              0
##   23.6              0              0              0              0
##   23.7              0              0              0              0
##   23.8              0              0              0              0
##   23.9              0              0              0              0
##   24.5              0              0              0              0
##   24.7              0              0              0              0
##   25                0              0              0              0
##   26.4              0              0              0              1
##   26.7              0              0              0              0
##   27.1              1              0              0              0
##   27.5              0              0              0              0
```

```
##    27.9                   0                0                0                0
##    28.6                   0                0                1                0
##    29.6                   0                0                0                0
##    29.8                   0                0                0                0
##    30.8                   0                0                0                0
##    31.6                   0                0                0                0
##    33.2                   0                0                0                0
##    33.3                   0                0                0                0
##    33.4                   0                0                0                0
##    34.7                   0                0                0                0
##    36                     0                0                0                0
##    36.2                   0                0                0                0
##    36.5                   0                0                0                0
##    37.3                   0                0                0                0
##    41.3                   0                0                0                0
##    43.1                   0                0                0                0
##    46                     0                0                0                0
##    50                     0                0                0                0
##        pred
## true    26.6464230693363 26.6767801036778 27.6905011906444 28.0422720924112
##    5                    0                0                0                0
##    7                    0                0                0                0
##    7.2                  0                0                0                0
##    8.4                  0                0                0                0
##    8.5                  0                0                0                0
##    10.4                 0                0                0                0
##    10.5                 0                0                0                0
##    11.5                 0                0                0                0
##    11.8                 0                0                0                0
##    11.9                 0                0                0                0
##    12                   0                0                0                0
##    13.1                 0                0                0                0
##    13.2                 0                0                0                0
##    13.5                 0                0                0                0
##    13.6                 0                0                0                0
##    13.8                 0                0                0                0
##    14.3                 0                0                0                0
##    14.4                 0                0                0                0
##    14.5                 0                0                0                0
##    14.6                 0                0                0                0
##    15.2                 0                0                0                0
##    15.3                 0                0                0                0
##    16.1                 0                0                0                0
##    16.2                 0                0                0                0
##    16.8                 0                0                0                0
##    17.1                 0                0                0                0
##    17.5                 0                0                0                0
##    17.6                 0                0                0                0
##    17.8                 0                0                0                0
##    18.1                 0                0                0                0
##    18.2                 0                0                0                0
##    18.5                 0                0                0                0
##    18.6                 0                0                0                0
##    18.7                 0                0                0                0
```

```
##   19.2                0                 0                 0                 0
##   19.3                0                 0                 0                 0
##   19.4                0                 0                 0                 0
##   19.6                0                 0                 0                 0
##   19.8                0                 0                 0                 0
##   19.9                0                 0                 0                 0
##   20                  0                 0                 0                 0
##   20.3                0                 0                 0                 0
##   20.5                0                 0                 0                 0
##   20.6                0                 0                 0                 0
##   21.4                0                 0                 0                 0
##   21.6                0                 0                 0                 0
##   21.7                0                 0                 0                 0
##   21.9                0                 0                 0                 0
##   22.5                0                 0                 0                 0
##   22.6                0                 0                 0                 0
##   22.7                0                 0                 0                 0
##   23                  0                 0                 0                 0
##   23.1                0                 0                 0                 0
##   23.4                0                 0                 0                 0
##   23.6                0                 0                 1                 0
##   23.7                0                 0                 0                 0
##   23.8                0                 0                 0                 0
##   23.9                0                 0                 0                 0
##   24.5                0                 0                 0                 0
##   24.7                0                 0                 0                 0
##   25                  0                 0                 0                 0
##   26.4                0                 0                 0                 0
##   26.7                0                 0                 0                 0
##   27.1                0                 0                 0                 0
##   27.5                0                 0                 0                 0
##   27.9                0                 0                 0                 0
##   28.6                0                 0                 0                 0
##   29.6                1                 0                 0                 0
##   29.8                0                 0                 0                 0
##   30.8                0                 0                 0                 1
##   31.6                0                 0                 0                 0
##   33.2                0                 0                 0                 0
##   33.3                0                 0                 0                 0
##   33.4                0                 0                 0                 0
##   34.7                0                 0                 0                 0
##   36                  0                 0                 0                 0
##   36.2                0                 0                 0                 0
##   36.5                0                 0                 0                 0
##   37.3                0                 0                 0                 0
##   41.3                0                 0                 0                 0
##   43.1                0                 0                 0                 0
##   46                  0                 0                 0                 0
##   50                  0                 1                 0                 0
##        pred
## true   29.0247392665017 31.2307271374787 31.291736858072 31.4718946570604
##   5                    0                0               0                0
##   7                    0                0               0                0
##   7.2                  0                0               0                0
```

```
##   8.4              0              0              0              0
##   8.5              0              0              0              0
##   10.4             0              0              0              0
##   10.5             0              0              0              0
##   11.5             0              0              0              0
##   11.8             0              0              0              0
##   11.9             0              0              0              0
##   12               0              0              0              0
##   13.1             0              0              0              0
##   13.2             0              0              0              0
##   13.5             0              0              0              0
##   13.6             0              0              0              0
##   13.8             0              0              0              0
##   14.3             0              0              0              0
##   14.4             0              0              0              0
##   14.5             0              0              0              0
##   14.6             0              0              0              0
##   15.2             0              0              0              0
##   15.3             0              0              0              0
##   16.1             0              0              0              0
##   16.2             0              0              0              0
##   16.8             0              0              0              0
##   17.1             0              0              0              0
##   17.5             0              0              0              0
##   17.6             0              0              0              0
##   17.8             0              0              0              0
##   18.1             0              0              0              0
##   18.2             0              0              0              0
##   18.5             0              0              0              0
##   18.6             0              0              0              0
##   18.7             0              0              0              0
##   19.2             0              0              0              0
##   19.3             0              0              0              0
##   19.4             0              0              0              0
##   19.6             0              0              0              0
##   19.8             0              0              0              0
##   19.9             0              0              0              0
##   20               0              0              0              0
##   20.3             0              0              0              0
##   20.5             0              0              0              0
##   20.6             0              0              0              0
##   21.4             0              0              0              0
##   21.6             0              0              0              0
##   21.7             0              0              0              0
##   21.9             0              0              0              0
##   22.5             0              0              0              0
##   22.6             0              0              0              0
##   22.7             0              0              0              0
##   23               0              0              0              0
##   23.1             0              0              0              0
##   23.4             0              0              0              0
##   23.6             0              0              0              0
##   23.7             0              0              0              0
##   23.8             0              0              0              0
```

```
##   23.9                   0                0                0                0
##   24.5                   0                0                0                0
##   24.7                   0                0                0                0
##   25                     0                0                0                0
##   26.4                   0                0                0                0
##   26.7                   1                0                0                0
##   27.1                   0                0                0                0
##   27.5                   0                0                0                0
##   27.9                   0                0                0                0
##   28.6                   0                0                0                0
##   29.6                   0                0                0                0
##   29.8                   0                0                0                0
##   30.8                   0                0                0                0
##   31.6                   0                1                0                0
##   33.2                   0                0                0                0
##   33.3                   0                0                0                0
##   33.4                   0                0                1                0
##   34.7                   0                0                0                1
##   36                     0                0                0                0
##   36.2                   0                0                0                0
##   36.5                   0                0                0                0
##   37.3                   0                0                0                0
##   41.3                   0                0                0                0
##   43.1                   0                0                0                0
##   46                     0                0                0                0
##   50                     0                0                0                0
##       pred
## true   31.5719925879816 32.6313713536693 33.3931107229457 33.7884973895489
##   5                     0                0                0                0
##   7                     0                0                0                0
##   7.2                   0                0                0                0
##   8.4                   0                0                0                0
##   8.5                   0                0                0                0
##   10.4                  0                0                0                0
##   10.5                  0                0                0                0
##   11.5                  0                0                0                0
##   11.8                  0                0                0                0
##   11.9                  0                0                0                0
##   12                    0                0                0                0
##   13.1                  0                0                0                0
##   13.2                  0                0                0                0
##   13.5                  0                0                0                0
##   13.6                  0                0                0                0
##   13.8                  0                0                0                0
##   14.3                  0                0                0                0
##   14.4                  0                0                0                0
##   14.5                  0                0                0                0
##   14.6                  0                0                0                0
##   15.2                  0                0                0                0
##   15.3                  0                0                0                0
##   16.1                  0                0                0                0
##   16.2                  0                0                0                0
##   16.8                  0                0                0                0
##   17.1                  0                0                0                0
```

```
## 17.5               0               0               0               0
## 17.6               0               0               0               0
## 17.8               0               0               0               0
## 18.1               0               0               0               0
## 18.2               0               0               0               0
## 18.5               0               0               0               0
## 18.6               0               0               0               0
## 18.7               0               0               0               0
## 19.2               0               0               0               0
## 19.3               0               0               0               0
## 19.4               0               0               0               0
## 19.6               0               0               0               0
## 19.8               0               0               0               0
## 19.9               0               0               0               0
## 20                 0               0               0               0
## 20.3               0               0               0               0
## 20.5               0               0               0               0
## 20.6               0               0               0               0
## 21.4               0               0               0               0
## 21.6               0               0               0               0
## 21.7               0               0               0               0
## 21.9               0               0               0               0
## 22.5               0               0               0               0
## 22.6               0               0               0               0
## 22.7               0               0               0               0
## 23                 0               0               0               0
## 23.1               0               0               0               0
## 23.4               0               0               0               0
## 23.6               0               0               0               0
## 23.7               0               0               0               0
## 23.8               0               0               0               0
## 23.9               0               0               0               0
## 24.5               0               0               0               0
## 24.7               0               0               0               0
## 25                 0               0               0               0
## 26.4               0               0               0               0
## 26.7               0               0               0               0
## 27.1               0               0               0               0
## 27.5               0               0               0               0
## 27.9               0               0               0               0
## 28.6               0               0               0               0
## 29.6               0               0               0               0
## 29.8               0               0               0               0
## 30.8               0               0               0               0
## 31.6               0               0               0               0
## 33.2               0               0               0               0
## 33.3               0               0               0               0
## 33.4               0               0               0               0
## 34.7               0               0               0               0
## 36                 0               0               0               1
## 36.2               1               0               0               0
## 36.5               0               0               1               0
## 37.3               0               1               0               0
## 41.3               0               0               0               0
```

```
##    43.1                 0                0                0                0
##    46                   0                0                0                0
##    50                   0                0                0                0
##        pred
## true   34.6794463797366 35.5564256432081 37.1123811893405 37.4661737282257
##    5                    0                0                0                0
##    7                    0                0                0                0
##    7.2                  0                0                0                0
##    8.4                  0                0                0                0
##    8.5                  0                0                0                0
##    10.4                 0                0                0                0
##    10.5                 0                0                0                0
##    11.5                 0                0                0                0
##    11.8                 0                0                0                0
##    11.9                 0                0                0                0
##    12                   0                0                0                0
##    13.1                 0                0                0                0
##    13.2                 0                0                0                0
##    13.5                 0                0                0                0
##    13.6                 0                0                0                0
##    13.8                 0                0                0                0
##    14.3                 0                0                0                0
##    14.4                 0                0                0                0
##    14.5                 0                0                0                0
##    14.6                 0                0                0                0
##    15.2                 0                0                0                0
##    15.3                 0                0                0                0
##    16.1                 0                0                0                0
##    16.2                 0                0                0                0
##    16.8                 0                0                0                0
##    17.1                 0                0                0                0
##    17.5                 0                0                0                0
##    17.6                 0                0                0                0
##    17.8                 0                0                0                0
##    18.1                 0                0                0                0
##    18.2                 0                0                0                0
##    18.5                 0                0                0                0
##    18.6                 0                0                0                0
##    18.7                 0                0                0                0
##    19.2                 0                0                0                0
##    19.3                 0                0                0                0
##    19.4                 0                0                0                0
##    19.6                 0                0                0                0
##    19.8                 0                0                0                0
##    19.9                 0                0                0                0
##    20                   0                0                0                0
##    20.3                 0                0                0                0
##    20.5                 0                0                0                0
##    20.6                 0                0                0                0
##    21.4                 0                0                0                0
##    21.6                 0                0                0                0
##    21.7                 0                0                0                0
##    21.9                 0                0                0                0
##    22.5                 0                0                0                0
```

```
##   22.6                  0                0                0                0
##   22.7                  0                0                0                0
##   23                    0                0                0                0
##   23.1                  0                0                0                0
##   23.4                  0                0                0                0
##   23.6                  0                0                0                0
##   23.7                  0                0                0                0
##   23.8                  0                0                0                0
##   23.9                  0                0                0                0
##   24.5                  0                0                0                0
##   24.7                  0                0                0                0
##   25                    0                0                0                0
##   26.4                  0                0                0                0
##   26.7                  0                0                0                0
##   27.1                  0                0                0                0
##   27.5                  0                0                0                0
##   27.9                  0                0                0                0
##   28.6                  0                0                0                0
##   29.6                  0                0                0                0
##   29.8                  0                0                0                0
##   30.8                  0                0                0                0
##   31.6                  0                0                0                0
##   33.2                  1                0                0                0
##   33.3                  0                1                0                0
##   33.4                  0                0                0                0
##   34.7                  0                0                0                0
##   36                    0                0                0                0
##   36.2                  0                0                0                0
##   36.5                  0                0                0                0
##   37.3                  0                0                0                0
##   41.3                  0                0                1                0
##   43.1                  0                0                0                0
##   46                    0                0                0                1
##   50                    0                0                0                0
##       pred
## true   37.711928956385 44.8303092046667 51.1831011274403 51.3050431301172
##   5                    0                0                0                0
##   7                    0                0                0                0
##   7.2                  0                0                0                0
##   8.4                  0                0                0                0
##   8.5                  0                0                0                0
##   10.4                 0                0                0                0
##   10.5                 0                0                0                0
##   11.5                 0                0                0                0
##   11.8                 0                0                0                0
##   11.9                 0                0                0                0
##   12                   0                0                0                0
##   13.1                 0                0                0                0
##   13.2                 0                0                0                0
##   13.5                 0                0                0                0
##   13.6                 0                0                0                0
##   13.8                 0                0                0                0
##   14.3                 0                0                0                0
##   14.4                 0                0                0                0
```

```
##   14.5              0                0                0                0
##   14.6              0                0                0                0
##   15.2              0                0                0                0
##   15.3              0                0                0                0
##   16.1              0                0                0                0
##   16.2              0                0                0                0
##   16.8              0                0                0                0
##   17.1              0                0                0                0
##   17.5              0                0                0                0
##   17.6              0                0                0                0
##   17.8              0                0                0                0
##   18.1              0                0                0                0
##   18.2              0                0                0                0
##   18.5              0                0                0                0
##   18.6              0                0                0                0
##   18.7              0                0                0                0
##   19.2              0                0                0                0
##   19.3              0                0                0                0
##   19.4              0                0                0                0
##   19.6              0                0                0                0
##   19.8              0                0                0                0
##   19.9              0                0                0                0
##   20                0                0                0                0
##   20.3              0                0                0                0
##   20.5              0                0                0                0
##   20.6              0                0                0                0
##   21.4              0                0                0                0
##   21.6              0                0                0                0
##   21.7              0                0                0                0
##   21.9              0                0                0                0
##   22.5              0                0                0                0
##   22.6              0                0                0                0
##   22.7              0                0                0                0
##   23                0                0                0                0
##   23.1              0                0                0                0
##   23.4              0                0                0                0
##   23.6              0                0                0                0
##   23.7              0                0                0                0
##   23.8              0                0                0                0
##   23.9              0                0                0                0
##   24.5              0                0                0                0
##   24.7              0                0                0                0
##   25                0                0                0                0
##   26.4              0                0                0                0
##   26.7              0                0                0                0
##   27.1              0                0                0                0
##   27.5              0                0                0                0
##   27.9              0                0                0                0
##   28.6              0                0                0                0
##   29.6              0                0                0                0
##   29.8              0                0                0                0
##   30.8              0                0                0                0
##   31.6              0                0                0                0
##   33.2              0                0                0                0
```

```
##    33.3               0               0               0               0
##    33.4               0               0               0               0
##    34.7               0               0               0               0
##    36                 0               0               0               0
##    36.2               0               0               0               0
##    36.5               0               0               0               0
##    37.3               0               0               0               0
##    41.3               0               0               0               0
##    43.1               1               0               0               0
##    46                 0               0               0               0
##    50                 0               1               1               1
```

```r
#pred=predict(svmfit, newdata=Boston[test,])
#MAE(pred)
```

```r
print(1 - sum(diag(prop.table(tab))))

pred=predict(svmfit, newdata=Boston[test,])

mean_sqr_error_b <- MSE(pred, Boston[test, ]$medv)
print(mean_sqr_error_b)

mean_avg_error_b <- MAE(pred, Boston[test, ]$medv)
print(mean_avg_error_b)
```

The MCR (missclassification rate) in the case of radial SVM is 0.97. The mean squared error is 24.67. The mean average error is 2.7.